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THE IRON TRADE REVIEW

VOLUME XXXIII. CLEVELAND, O. DECEMBER 6, 1900 CHICAGO, ILL. NUMBER 49

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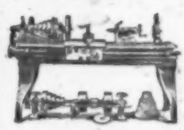

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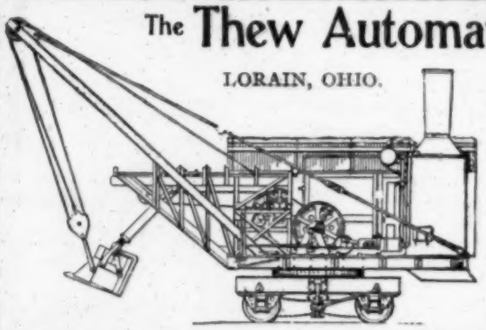
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THE IRON TRADE REVIEW

VOLUME XXXIII. CLEVELAND, O. DECEMBER 6, 1900. CHICAGO, ILL. NUMBER 49

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Steady buying in all finished lines, with quieter markets for pig iron, in contrast with the rush at election time and in the fortnight following, is the present situation in the iron trade. The pig iron market is reflecting the uncertainty that exists as to ore prices for next year. It matters not that buyers of pig iron may entertain an erroneous idea of the size of the reduction that will be made in the cost of that product. Until it is known what the basis really is to be the practice of contracting for six, nine and twelve months ahead will not be resumed. The fact that an interval of more moderate buying has come to the trade in pig iron has not altered the very strong situation in respect to all finished products, and it goes without saying that this will be felt in due time in primary markets. No further advance has been made by furnacemen in the week; and the recent additions, with those about to be made, to the list of active furnaces, coming at the quiet time of the year, will tend to preserve an equilibrium for some weeks to come. In Bessemer iron there is no sign of new buying as yet, but some steel companies are believed to be now melting more metal than they produce, so that the using up of piled iron is only a matter of weeks. Meantime very little increase has been made to Bessemer iron production by merchant furnaces. An inquiry for 10,000 tons went the rounds the past week and bids are understood to have been from $13.25 to $13.50 at valley furnace. Thus far the advance in foundry iron has not been sufficient to cause extensive blowing in of idle furnaces, but there is a large idle capacity that might be profitably employed at today's figures, under the revision of coke prices that has taken place in the past eight months. Central Western furnacemen had been counting on $1.50 coke, basing their estimate on conditions existing in the early fall; but $1.75 seems to be minimum, and for some of the Connellsville product $2 will be paid under new contracts. A considerable buying movement has been going on in the past fortnight. The billet situation is unchanged, and is not likely to show any change in the near future, the large contracts having been made before the advance. It is found that the heavy export business taken on by certain of the steel companies in the summer is giving the billet mills more than they can do to keep up deliveries to their domestic trade. In some cases mills rolling steel bars have been unable to run to their full capacity because they were compelled to take their turn with foreign buyers, in the filling of billet orders. In general the export trade has fallen off sharply, owing to declines in European markets, but shipments on old contracts are large, and the foreign press has taken some alarm at the heavy imports of American steel, mistakenly considering them the beginning of a new campaign. Rail business has been active in the past 10 days. The Vanderbilt roads placed 80,000 tons and from other sources there was good buying. The Chicago district booked 60,000 tons. The demand upon mills in all lines is well sustained, and prices are firm with advances under discussion, particularly on plates. Manufacturers of plates at a meeting in New York considered a revision of delivered prices, so as to put all on a Pittsburg basis, with freight rates added. This will probably be done, the effect being to advance prices for points more remote from Pittsburg. Structural mills are steadily booking orders and prospects appear excellent for spring work, many enterprises being taken up again that were laid aside early in the year. Definite announcement is made of a reduction of freights on eastbound iron and steel, both for domestic and foreign shipment. On the other hand railroads are conferring for the maintenance of rates on west-bound business, which recently have been somewhat irregular.

PITTSBURG.

OFFICE OF *The Iron Trade Review*, 429 PARK BUILDING, Dec. 5.

Despite the fact that the local finished material market has ruled strong for some time it has not yet affected the crude product, and the past week has seen liberal buying of rolled products while business in crude material was very limited. Foundry and Bessemer irons were little sought after and there is little indication of an immediate revival. All price agreements in effect at present on finished material are being strictly adhered to, and it is an easy matter for the manufacturers to secure the agreed prices in the face of the heavy demand. Local mills, on bars, plates, sheets and structural material are quite behind on their deliveries and every day's orders widens the gap. Few mills can promise delivery in less than a month and many orders are being taken for delivery in two, three and even four months. There is every indication that the price of plates will be advanced again. The largest producer, with an enormous output is practically filled up for several months and other mills are booking orders at a rate that is astonishing for this season of the year. A meeting of the plate manufacturers was held in New York City last Friday and Saturday at which the present situation was discussed, and a committee was appointed for the purpose of readjusting the freight differentials. At the present time the same freight differentials that are applied in the beam agreement hold good in the plate agreement, making a 15-cent freight rate to Chicago and New York, 10 cents to Cleveland and Buffalo and 13 cents to Philadelphia. It is proposed to aid the freight tariffs that now hold good to the different points to the Pittsburg base, which would mean at the present tariffs a slight advance over the present prices to points at a distance from Pittsburg.

Within a week or ten days the railroads entering this district will announce a reduction in domestic rates on finished products, and although not definitely decided it is stated that a reduction will also be made in the freight rates on products for export purposes much greater than that on domestic rates. It was again rumored here during the past week that the Carnegie Steel Co. would add a pipe mill to its present finishing equipment. It can be stated that there is absolutely no foundation for the report. The coke trade, which has not shared to any marked extent in the general business revival is reported in a much better condition and inquiries for delivery next year have been coming in during the past week

from all parts of the country. Coke manufacturers outside of the Connelfsville region are now holding for somewhat better prices and this has given a much better tone to the market.

PIG IRON.—The foundrymen in this district have evidently supplied their wants for some time, judging from the small amount of buying during the past week. In Bessemer iron there is little doing and the time when the merchant furnaces in the valleys will again be considerable sellers is evidently somewhere in the distant future. It was reported during the week that some efforts were being made to buy Bessemer for speculative purposes, but none of the furnacemen report any sales. No. 2 foundry is somewhat weaker, owing to the sudden falling off in demand and only for special brands is $15 a ton being received. There has been some buying of forge iron at $13.25 to $13 50 per ton. On Bessemer iron the quotation merely nominal at $14, while a large order could be readily placed at $13.75, delivered Pittsburg. We make the following quotations:

Bessemer, Pittsburg	(Nominal)	14.co
No. 1 Foundry	15.25 to	15.75
No. 2 Foundry	14 50 to	15 co
No. 3 Foundry	14 co to	14 50
Gray Forge, Pittsburg	13.25 to	13.50

STEEL.—Owing to the fact that the large buyers of billets have practically all been taken care of, there has been little business at the agreed prices We quote 4 x 4 billets, delivered, Pittsburg, Wheeling or Valley at $19.75. On less than 4-inch billets down to 1¼ inch $1 extra is charged. Open-hearth billets are $1 per ton above Bessemer billets at all delivered points. Sheet and tin bars are $1 above Bessemer billets.

FERRO-MANGANESE.—The largest producer continues to quote $65 per ton for car lot orders for domestic 80 per cent and $75 per ton for less than car lots. It is denied that any lower quotations are being made.

RAILS AND TRACK MATERIAL.—No new large business has been placed in steel rails. Light rails continue in good demand and high prices are being received for light rails for immediate shipment. After a shutdown of several weeks, during which period extensive improvements have been made at the Edgar Thomson plant of the Carnegie Steel Co., operation were resumed this week. The experiment that will be made to produce harder rails by leaving them for a longer period on the cooling beds before giving them the final pass will be watched with much interest. Demand for spikes and rail material is good. Prices are as follows, unchanged: Rails, standard sections, 50 pounds and over, in lots of 200 tons and over, $26; car lots and less than 200 tons, $28; less than car lots, $30. 8 to 12 pounds, $29 to $30; 16 to 20 pounds, $28 to $29; 25 to 40 pounds, $27. Track material. Spikes, 1.70c to 1 75c; track bolts, square heads, 2.25c; hexagon heads, 2 35c; fish plates, 1.40c to 1.50c.

SPELTER.—The market during the past week was very steady and we quote prime Western grades at 4.25c to 4 30c, Pittsburg.

MUCK BARS.—There has been a somewhat better demand for muck iron and we note the sale of 500 tons at $25 Pittsburg. Smaller lots command $25 25 to $25 50, per ton. Scrap muck is held at $1 per ton less than standard grades.

SKELP.—The demand for iron and steel skelp continues strong as the pipe business is in a flourishing condition. We quote grooved iron skelp at 1.55c to 1.60c and sheared at 1.60c to 1.65c. Steel skelp is held at 1.30c to 1.35c.

BARS.—Mills in this district are finding it more difficult daily to make the shipments called for and new orders and specifications on running contracts are keeping them in operation to their fullest capacity. Prices are firm at 1.25c for large orders and 1.30c to 1.35c for small orders and the general small trade. Common iron bars are held at 1 30c to 1.35c, Pittsburg, and at 1.25c to 1.30c in the valleys. Refined iron bars are held at 1.75c to 2c, delivered, Pittsburg.

PLATES.—At the meeting of the plate manufacturers held in New York City last week a committee was appointed for the purpose of readjusting the freight differentials now existing on plates delivered at various points throughout the country. The present differentials are arbitrary and are the same as adopted by the manufacturers of structural material. Some of the mills have requested that the regular tariff rates be added to the Pittsburg base for delivery throughout the country, and it is probable that this will be done. This will result in a slight advance on present prices for delivery at points a distance from Pittsburg. The agreed prices are being firmly maintained and one of the largest producers is practically filled up for several months. If the present demand continues there is little doubt that another advance will be shortly made in price. Another meeting of the plate manufacturers is scheduled to be held in New York some time this week. Prices are firm and unchanged as follows: Tank plate, 1 35c; shell, 1.40c; flange, 1.45c; marine, 1.55c; fire-box, 1.75c to 3c.

SHEETS.—Demand for sheets continues good and galvanized sheets for immediate delivery are scarcely to be had. While the largest producer quotes 3c for No. 28 gauge on ordinary business, we have been advised that some of the independent producers are still quoting 2.90c. We quote as follows: No 28 gauge, black sheets, one pass through cold rolls, 2.90c to 3c; No. 27, 2.80c to 2 90c. No. 26 is held at 2 75c to 2.80c; No. 24 at 2 55c; No. 20 at 2.45c; No. 18 at 2.20c to 2 25c; No. 16, 1.90c to 2c; No. 14, 1.80c; Nos. 11 and 12, 1.60c to 1.70c, and No. 10, 1.45c to 1.50c. Galvanized sheets are quoted 7 and 10 and 5 off, with no freight allowance.

STRUCTURAL MATERIAL.—Considerable business in structural material continues to be placed and prices remain firm and unchanged. We make the following quotations: Beams and channels, 3 to 15 inches, 1.50c; 18 to 24 inches, 1.60c; tees, 1.55c; zees, 1.50c; angles, from 3 to 6 inches, 1.40c; universa mill plates, 1.35c.

PIPES AND TUBES.—Demand for pipes and tubes keeps up in an unprecedented manner, and both the combination and the independent mills are making large bookings. The report that the Carnegie Steel Co. would go into the pipe business in opposition to the National Tube Co. is treated here as an absurdity. Prices are unchanged. Discounts to consumers in car lots, Pittsburg, are as follows:

MERCHANT PIPE.

	Black. per cent.	Galv'd. per cent
⅛ to ⅜ inch and 11 to 12 inch	61	48
½ to 10 inch	68½	56

BOILER TUBES.

	22 Feet and under. Per cent.		Over 22 Feet. Per cent.	
	Iron.	Steel.	Iron.	Steel.
1 to 1½ and 2½ inches	49½	55	44½	50
1¾ to 2¼ inches	45	51	39½	46
2¾ to 13 inches	57	62	52½	58

CASING.

	S. and S., per cent.
2 to 3 inches	58
3¼ to 4 inches	63
4¼ to 12¼ inches	65

O. D. PIPE.

	Per cent.
14 to 22 inches	42
24 inches, o. d. and larger	37

THREADS AND COUPLINGS.

	Per cent.
14 to 16 inches, o. d.	35

MERCHANT STEEL.—The demand for merchant steel keeps up fairly well considering the season of the year. We make the following quotations: Tire steel in carload lots and over, 1.25c; less than carload lots, 1.35c. Toe calk is held at 1.35c to 1.40c in large lots, and in small lots as high as 1.50c is asked. Tool steel is held at 7c and upward according to quality. Hoops and bands, 2c to 2.10c; shafting, carload lots, 60 per cent off; less than carload lots, 55 per cent off.

WIRE AND WIRE NAILS.—At the meeting of the cut nail manufacturers held here last week the chairman of the executive committee was given full power to advance the price of cut nails in case an advance is made by the American Steel & Wire Co. There is little indication however, of an early advance in either wire or cut nails. Demand is fair for all kinds of wire, although the rural demand has fallen off considerably. Our quotations unchanged are as follows: Single carloads of wire nails to jobbers, $2.20, Pittsburg; to retailers, $2 30. Plain wire carload lots, is quoted at $2.15 to jobbers and $2.25 to retailers; painted barb wire, $2.50 in carload lots to jobbers and $2.60 to retailers; galvanized barb wire, $2.80 in carload lots to jobbers and $2 90 to retailers. Cut nails are held at $1.95, Pittsburg, in carload lots with 2 per cent off in 10 days.

OLD MATERIAL.—Practically the only feature in the old material market at the present time is the persistent demand for iron rails. Sales of seven hundred ton lots were made

during the week at $21.50 to $22, and smaller lots sold as high as $22.50 per ton. Outside of this the market is featureless with a falling off in the demand. We revise quotations as follows: New Bessemer melting stock, $14 to $14.50, gross; old iron rails, $21 to $22, gross; busheling scrap, $12.50 to $13; cast borings, $7, net; wrought turnings, $8, net; cast scrap, $13, gross; steel rails, $14.50; mill lengths, $15.50; car wheels, $18, gross.

COKE.—More inquiries have been made during the past week for coke for delivery next year than for many months, and a number of contracts have already been closed. Some of the non-Connellsville producers are asking $1.75 for their product for delivery throughout the year, while another large outside producer is asking $2 for furnace coke. Non-Connellsville foundry coke is held at $2.15 to $2.25, while Connellsville coke is held at $2.25 to $2 50 per ton. Connellsville furnace coke is quoted at $2. For the week ending Saturday, Nov. 24 the total estimated production of the Connellsville region was 155,746 tons, a decrease of 637 tons over the production of the previous week.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1522 MONADNOCK BLOCK, Dec. 4.

There is a very good demand for almost every kind of material, and while mill and furnace representatives report very few large single orders closed, undoubtedly a heavy tonnage of business has been placed in the past week in a quiet way. Many of the mills are reported to be well filled with orders running well into next year, and some of the furnace companies are in about as good condition. As a consequence they are very firm in their views, and are making no concessions from the quoted schedules of prices. Buyers are usually content to pay the prices asked, with little shopping around, as they are nearly all of them of the opinion that the market is permanently on a higher level than that of four or five weeks ago.

PIG IRON.—While no especially important single orders are reported, the total tonnage closed was large, and comes from all classes of buyers. An encouraging feature is the fact that a very considerable part of the buying last week, amounting to several thousand tons, was done by consumers who had previously bought their absolute requirements some time ago, and have now placed contracts for additional material to cover probable additional requirements. The belief is general that prices will be no lower. The furnaces, as a rule, are not anxious for very much higher prices, but would prefer that they get no higher than possibly $15 to $16, Chicago. This would insure good profits for producers, and if there is no further advance, would eliminate the possibility of a dangerous boom, with a more dangerous reaction. The local furnaces are well sold ahead, having nearly if not quite enough orders on their books to run them until the middle of next year. Quotations of local irons were not advanced as much as those for Southern irons, and as a consequence the Southern furnaces have been compelled to reduce their quotations to meet the market. They are now quoting on a basis of $14.60 for No. 2 foundry. Prices are revised as follows:

Lake Sup. Charcoal	$18 50 @ $19 50	Southern Coke No. 4	$13 60 @ 14 10
Local Coke Fdy. No. 1	15 50 @ 16 00	Southern No 1 Soft	15 10 @ 15 60
Local Coke Fdy. No. 2	14 50 @ 15 00	Southern No 2 Soft	14 60 @ 15 10
Local Coke Fdy. No 3	14 00 @ 14 50	Southern Silveries	16 25 @ 16 75
Local Scotch Fdy. No.1	15 50 @ 16 00	Jackson Co. Silveries	18 50 @ 20 00
Local Scotch Fdy. No.2	14 50 @ 15 00	Ohio Strong Softeners	16 80 @ 17 30
Local Scotch Fdy No.3	14 00 @ 14 50	Alabama Car Wheel	21 75 @ 22 75
Southern Coke No. 1	15 10 @ 15 60	Malleable Bessemer	15 00 @ 15 50
Southern Coke No. 2	14 60 @ 15 10	Coke Bessemer	15 00 @ 15 50
Southern Coke No. 3	14 10 @ 14 60		

BARS.—Sales continue large, and several very good sized contracts were placed last week. The largest producer reports the heaviest trade in its history in the past two weeks. Smaller mills are doing equally well, and the demand indicates a continuance of the large business. Mills are all very firm in holding to the quoted prices of 1.45c for iron and 1.35c to 1.45c for steel, half extras, Chicago delivery.

STRUCTURAL MATERIAL.—The largest contract placed in the week was that for 8,000 tons of bridge material for track elevation, which was taken by the American Bridge Co., the steel to be divided among various mills. The drainage canal bridges have not yet been let. A number of building projects, aggregating possibly 20,000 tons, are hanging fire, the promoters waiting to see whether or not the labor troubles will be finally settled before spring work commences. There is no doubt that the labor difficulties of the past year have caused a great many building projects to be delayed, and possibly some of them have been abandoned permanently. Some structural business, in small lots, was placed last week, both in and out of the city, and there is more to come. Quotations are as follows: Beams, 15 inches and under, 1.65c; 18 inches and over, 1 75c; angles under three inches, 1.40c to 1.45c; over six inches, 1.65c; three inches to six inches, 1.55c; plates, 1.53c; tees, 1.70c; zees, 1.65c; small lots from store are quoted ¼c to ½c higher.

RAILS AND TRACK SUPPLIES.—Sales of about 60,000 tons of rails were made in this market in the past two weeks. There are still a number of orders to be placed, which it is expected will come in very soon. There has been further talk of higher prices for standard sections. Quotations are as follows: Rails, standard sections, $26; light sections, $26 to $28; splice bars, 1.40c to 1.50c; spikes, 1.65c to 1.75c; track bolts, hexagon nuts, 2.05c to 2 10c; square nuts, 2c to 2.05c.

PLATES.—The demand is excellent, and several good contracts were closed in the week. Inquiries in hand denote a considerable business to be placed in the immediate future. The market is very firm and unchanged Quotations are made as follows, for mill shipment, Chicago delivery: Tank steel, 1.53c; flange steel, 1.58c; marine steel, 1.63c; fire-box steel, 2.43c and up, according to brand.

BILLETS AND RODS.—Some sales of billets were made at the association price of $20.75, Chicago. There is a good demand. It is reported that the contract has been signed for the sale of the rod output of the Illinois Steel Co. to the American Steel & Wire Co. for the ensuing year, but no particulars can be obtained.

SHEETS.—Business continues very large, sales last week equalling those of any previous week. Business comes from all sources, jobbers and consumers, and gives every hope of being permanently good. The mills are all busy and well sold ahead. Quotations are firm and unchanged at 3.18c for No. 27 black, Chicago, and 70 and 10 per cent off for galvanized, f. o. b. mill.

MERCHANT STEEL.—Last week showed a good tonnage closed, including a few large contracts. The demand has fallen off slightly, but is still very good, and as the mills are all well sold ahead the market is very firm. Quotations are as follows, mill shipments, Chicago delivery: Smooth-finished tire steel, 1.75c to 1.85c; open-hearth spring steel, 2.15c to 2.35c; toe calk, 2.40c to 2.55c; sleigh shoe, 1.70c to 1.80c; cutter shoe, 2.40c to 2.55c; ordinary tool steel, 6c to 7c; specials, 12½c and upwards.

MERCHANT PIPE.—Sales in small lots continue excellent, and some good orders for round lots were closed last week, with more of the same kind in sight for the immediate future. Random lengths are quoted as follows:

	MERCHANT PIPE.			
	Carload lots.		Less than carload lots.	
	Black Per cent.	Galv. Per cent.	Black Per cent.	Galv. Per cent.
⅛ to ⅜ and 11 to 12 in.	59.2	46.2	54.9	40.9
½ to 10 inches	66.7	53.3	61.9	48.9

WIRE AND WIRE NAILS.—There is no falling off in the very large business being received every day. Orders, on the contrary, seem to increase somewhat. Makers quote single carloads of wire nails at $2.48 f. o. b. Chicago, and $2.63 for less than carloads. On wire, current quotations are as follows: Plain annealed wire, $2.43; painted barb wire, $2.78; galvanized barb wire $3.08.

OLD MATERIAL.—Demand is hardly as large, but is still very good, and while sales have not been heavy, this is partly because stocks have not been adequate. The offerings of railroads and from the country are somewhat larger, but not sufficently so to make much difference in the situation. Prices are very firm, and in some cases have advanced. Dealers' selling prices, per gross ton, are made as follows:

Old iron rails	$18 50@$19 00	Country malleable	$10 00@$10 50
Old steel rails, long	15 00@ 15 50	Iron axles	20 50@ 21 00
Old steel rails, mixed	11 00@ 12 00	Cast borings	5 00@ 5 50
Relaying rails	20 00@ 21 00	Wrought turnings	8 50@ 9 00
Old wheels	16 00@ 17 00	Iron axle turnings	10 00@ 10 50
Railroad forge	17 50@ 18 00	Steel axle turnings	9 00@ 9 50
Dealer's forge	15 00@ 15 50	Mixed country steel	9 00@ 9 50
No. 1 cut mill	11 50@ 12 00	Stove plates	9 00@ 10 00
Heavy cast	14 00@ 14 50	Heavy melting steel	10 50@ 11 00
Railway malleable	11 50@ 12 00	Old iron splice bars	18 50@ 19 00

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
CAXTON BUILDING, Dec. 5.

It is likely that Escanaba shipments of ore will con inue for another week if weather permits. At various other ports announcement of the closing of the season has been made in the past week. There is no hurry about taking up the question of ore prices for next year. Furnaces are not making sales beyond the first quarter of 1901, as a rule and do not need to do any guessing as to their cost after May 1. More is said, as the size of the shipments from old ranges in the past two years is considered, of the limitations upon the Bessemer ore supply apart from the Mesabi range. Views of the proper price for next year, based on the well-known fact that little new ore has been found apart from the Mesabi, in the past two years, find some modification on the argument of furnacemen that a $10 decline in pig iron calls for a good-sized reduction in the price of ore. It seems foregone that the vessel rate will be reduced by something like 40 per cent. One view of the probabilities is that the 50 cents that comes from the lake freight will be matched by 50 cents from the ore miner, putting the base price at $4.50, as against $5 50 this year.

PIG IRON.—While the rush is over, there is steady buying of foundry pig iron for early delivery and on contracts extending through the first quarter of the new year. Both Northern and Southern irons are firm, with the latter held at prices that give Ohio furnaces the advantage. At $10.75 Birmingham Southern No. 2 is $14.60 delivered in Cleveland, while Northern iron is from 25 to 50 cents less. The outlook for the foundries is improving and a good run of work is promised for the winter. We quote No. 2 iron at $13.50 valley furnace, with an occasional sale at $13.25. Nothing is doing in forge iron, the valley mills still carrying stocks. Bessemer iron continues inactive. An inquiry for 10 000 tons has been up the past week, without resulting in business. Furnaces have quoted $13 25 and $13 50. Steel works are making inroads on their stocks of Bessemer iron but probably will not find it necessary to buy any outside iron until after the first of the year. Several additions to the list of active furnaces were made in November and one or two more will go in this week. We quote the Cleveland market:

Bessemer	$14 25@14 50	Valley Scotch No. 1	$14 75@ 15 25
No. 1 Strong Foundry	14 75 - 15 25	Valley Scotch No. 2	14 25@ 14 50
No. 2 Strong Foundry	14 25@14 50	Gray Forge, valley	12 50@ 13 00
No. 3 Foundry	13 50@14 00	Lake Superior Charcoal	18 00@ 18 50

BILLETS.—Inquiry has been made for billets for axles by Northern Ohio concerns, but no transactions in rod billets have been reported for some time, shipments to Cleveland rod mills from Northern Ohio steel works being under a long-standing contract.

FINISHED MATERIAL.—Rail business continues to be a factor in local buying. For steam and electric lines upward of 35,000 tons has been closed in the past two weeks. The plate mills are refusing business in some cases and in others are making rather unsatisfactory deliveries. Agreed prices do not stop business, inquiries continuing to come into local offices for considerable lots. Specifications on structural steel contracts are of good volume and there are indications that building in the spring will well reinforce the winter demand from bridge works and from manufacturers of heavy conveying and handling machinery. There is no change in quotations in any line of finished material, in the past week. We quote beams and channels at 1.50c Pittsburg; angles 3 inches and wider, 1 40c; less than 3 inches, 1.30c; tank plates, 1.35c Pittsburg; steel bars, 1.25c Pittsburg; bar iron, 1.25c to 1.30c, valley mill. Sheet mills are full of work and sellers are very firm in their ideas. We quote No. 27, one pass through cold rolls, 2.85c to 2 90c at mill; No. 28, at 2 95c to 3c. Heavier sheets range from 1.55c for No. 10 to 2.15c for No. 18.

OLD MATERIAL.—The feeling continues strong but transactions are not plentiful. We make quotations as follows, all for gross tons: Old iron rails, $19 to $20 Cleveland; old steel rails, $11.50 to $13; old car wheels, $15.50 to $16; No. 1 railroad wrought scrap, $16; mill scrap, $12; No. 1 machine cast scrap, $13.50; iron axles, $18.50; axle turnings, $10; wrought turnings, $8 50; cast borings, $6; grate bars, $8; sheet iron, $7; stove plate, $8.

CINCINNATI.

Dec. 3.

Matthew Addy & Co.'s review of trade conditions says: "The main difficulty that sellers of pig iron are having at the present time is a complete inability to get iron forward fast enough to meet the needs of consumers. The mail and wires are burdened with letters and messages urging that shipments be made more rapidly. All of which goes to show that consumers had put off buying until the last possible moment. Business continues good. There is a steady day-by day demand that is entirely satisfactory. All grades are being called for, but there is no distinctive feature to the market. We have apparently settled down to a regular gait that promises to keep up for some time to come. Our information is to the effect that the general foundry trade all through the Middle West has been much brisker during the past few weeks. Business, the general foundries report, 'has been picking up' at a lively rate, and they feel assured of a prosperous year ahead."

We quote from Rogers, Brown & Co.'s weekly report: The week under review has shown less excitement but the orders have been quite as numerous and the tonnage has aggregated as heavy as any of the preceeding weeks of November, which stands the greatest month of the year thus far. The demand has been for all classes and grades of iron, evidencing activity in the various industries consuming pig iron. While there has been liberal buying for future delivery, a large tonnage has been for immediate and December delivery. Stocks at the furnaces have been greatly reduced during November and 'clearance sales' have relieved several of the furnaces of their 'off' and irregular grades. The Bessemer market continues dull as compared with everything else, but the increased orders for steel and steel products will gradually and perhaps rapidly reduce the large accumulation of Bessemer stocks. Prices have been somewhat irregular but steadier than last week. Buyers are appreciating the healthy conditions of trade and the reasonableness of figures on standard brands which are comfortably sold up for early delivery."

We quote for cash, f. o. b. Cincinnati: Southern coke, No. 1 foundry $14 75 to $15.25; No. 2, $13 75 to $14 25; No. 3, $13 25 to $13 50; No. 4, $13 to $13 25; gray forge, $12 75 to $13; No. 1 soft, $14 75 to $15 25; No. 2, $13.75 to $14 25; Lake Superior coke, No. 1, $15.50 to $16; No. 2, $14.50 to $15; Hanging Rock charcoal, No. 1, $20 to $21; Jackson Co. silvery, No. 1, $17 to $17.50; standard Georgia car wheel, $18.75 to $19.75; Lake Superior charcoal, $19 to $20.50.

PHILADELPHIA.

Dec. 3.

The past week has seen some falling off in demand, though prices are firm, and very little business is being done below quoted figures. From now until the end of the year, the demand will probably moderate, as most of the large buyers have sufficient stock on hand to tide over the holidays. The buying is of the hand-to-mouth variety almost entirely. There is fear that under the expected increase of activity prices may go even higher. The situation has not been clarified sufficiently to enable buyers to make a reliable judgment of the outcome. With every prospect of a good home demand, foreign business has fallen off sharply, owing to the lower prices ruling abroad. Reports are current of an advance in plates, in view of a readjustment of delivered prices to correspond with the tariff rates from Pittsburg. On export business from Pittsburg, however, in all finished lines, it is reported that reductions will be made on freights to the seaboard, amounting in the case of billets to 40 cents. For the most part the market seems to be in very stable equilibrium. The next buying movement is expected to establish a basis of prices that will mean good returns in 1901.

PIG IRON.—Business has been quiet during the week. Buyers do not appear anxious about higher prices as yet. The supply has been slightly increased, and promises to be still further increased in the near future. Several furnaces have blown in during the week. Much of the accumulated stock has been worked off and a number of good orders have been booked for delivery in the first quarter of 1901. Some cheap lots have been taken, one for 5 000 tons at prices ruling early last month, and several for 500 to 1,000 tons under about the same conditions. A few sales have been made at the ful

advance. Quotations for Philadelphia and nearby points are as follows: No. 1X foundry, $16 50 to $17; No. 2X foundry, $15.50 to $16.25; No. 2 plain, $15 to $15 50; gray forge, standard brands, $14 50 to $15.

FINISHED MATERIAL.—Demand continues good and most of the mills are full for some time to come. Prices may be advanced still further in view of the persistent demand and the many inquiries that are constantly coming in. The large buyers will require heavy tonnages, as their current specifications indicate. Quotations are as follows: Best refined iron bars, 1.45c to 1.50c; steel bars, 1.40c to 1.45c; plates, ¼ inch and thicker, 1.50c to 1.55c; angles, 1.65c to 1.75; beams and channels, 1.65c to 1.75c; sheets, No. 10–12 1.80c to 2c; No. 14, 2.05c to 2.15c; No. 16, 2.20c; No. 20, 2.60c to 2.70c; No. 24, 2.90c; No. 27 3.10c; No. 28, 3.20c.

OLD MATERIAL.—There is a scarcity in most lines and prices are firm, with a tendency to advance. We quote as follows: Choice railroad scrap, $17 to $17.50; No. 1 yard scrap, ordinary, $13.50 to $14; No. 2 light scrap $11 50 to $12; machinery cast, $14 to $14.50; heavy steel scrap, $15.50 to $16; old iron rails, $17 50 to $18; old steel rails, $16 to $16.50; wrought turnings, $9.50 to $10; cast borings, $7.50 to $8; old car wheels, $17 to $17.50.

Reduction in Iron Freights to the East.

That the iron and steel interests of the Pittsburg district will soon secure both better domestic and export freight rates is now assured. Two weeks ago the railroads entering Pittsburg issued notices to the traffic managers of the large iron and steel interests that it had been practically decided to make a reduction in freights on east-bound material, both for domestic and export trade. No time for making the new schedule effective was announced, owing to the reported disagreement between the Pennsylvania railroad and the B. & O., over the reduction in rates to be made between Philadelphia and Baltimore. Despite this disagreement the reduction is to be made shortly. The ruling rate on pig iron is $2.80 per ton from Pittsburg to New York, and on billets $2.90. A reduction of 40 cents per ton is to be made, with proportional charges to other Eastern ports. On finished iron and steel the ruling carload rate is 18 cents per 100 pounds, or $4.03 per gross ton. This is to be reduced to 16 cents per 100 pounds, including the ligthterage in New York harbor. To Baltimore the rate will be 14 cents and to Philadelphia 13 cents. Boston rates on this traffic in finished iron and steel are to be made the same as the rate to New York on shipments that are to be exported.

Until recently Pittsburg shippers have had the advantage of summer rates to meet water competition. These are to be granted next year, when the rate on finished iron and steel to New York will be reduced to 13 cents per 100 pounds. This will be about April 15.

A meeting was held in Cleveland on Tuesday and Wednesday of this week by traffic officials of roads entering Cleveland, Pittsburg and Wheeling. There has been some irregularity on iron rates to western points recently and the meeting was for the purpose of maintaining uniformity. In view of the close of navigation traffic managers argue that the necessity for reductions does not exist, and that every effort should be made to uphold tariffs.

THE Kane-Maloney Iron & Steel Co., of Pittsburg, with offices at 817 Park Bldg., has applied for a Pennsylvania charter with a capital of $25,000. The new company will buy and sell old material and has already purchased a tract of land on 57th St. and the A. V. railway, where the scrap yard will be located. Contracts for part of the equipment for the yard have already been let. Thomas Carlin & Sons, of Allegheny, have been awarded the contract for furnishing two large shears, one of which will weigh 125,000 pounds, will have a 32-inch blade and will cut 6 inches of cold steel. It will be one of the largest shears ever built. The other will weigh 24,000 pounds, and will have a 20-inch blade. The equipment will also consist of a 20-ton crane as well as a 75-h. p. gas engine.

THE plant of the Monongahela Iron & Steel Co., at Lucas Station, Pa., which was shut down most of last week by high water in the Monongahela river, resumed this week.

LIMITED SUPPLY OF "OLD-RANGE" ORES.

While the iron ore deposits of the Lake Superior region are generally described as "practically inexhaustible," the fact is well known to the keenest gentlemen in the ore-producing buisness that the annual tonnage being sent out for the past few years has developed a few things that must not be underestimated. We are now sending out something like twenty million tons, as against a single million not so many years ago. It is divulging no secret to say that the fancy Bessemer ores of the older ranges are fast disappearing, having been shipped in seasons gone by, and it is apparent to those who keep well informed upon the conditions at the mines that the consumers of iron ores will have soon to be satisfied with ores containing more of phosphorus and less of iron than they have been in the habit of using, and insisting upon. In the city of Ishpeming, the Lake Angeline, once the pride of our town, and enjoying a national reputation for the quaity of its product, is fast rounding up its fine Bessemers, there being only a few years more of shipments from this class of material in sight, or, as a matter of fact, upon the company's lands in this place. The end of these once famous deposits can be seen, and the time of their exhaustion is not far distant. The old mine hematite of the Lake Superior has been worked out, and the Lake deposit, of much less size, is the only one thus far found to replace it. The ores beneath the old Lake Angeline basin are not yielding the percentage of Bessemers hoped for and expected, the Cleveland company mining a large quantity of non-Bessemer from this deposit. They have now in stock somewhere about sixty thousand tons, which will be carried over until another season.

Messrs. Alfred Kidder, agent, and Thomas Walters, superintendent, of the Lake Angeline mine, are now in Canada examining a property which is reported to carry a large amount of ore of Bessemer grade. The company has also purchased the Jackpot mine on the Gogebic range, hoping to develop a profitable mine at that ponit, and to make up for the shortening lenses at its older property.

The Menominee range has little Bessemer ore, this coming from the Aragon, Loretto and Pewabic principally. The Gogebic is not as prolific as was hoped or, and much of its product is injured by a wrong percentage of manganese.

The giant Mesabi is not showing as much ore of Bessemer grade as was figured upon a few years ago. One mine, noted for its immense shipments, and where one hundred millions of Bessemer grade ore were said to have been measured, now is reported to contain only a ninth of that quantity, while the non-Bessemer grades are of extremely poor quality. Added to this the peculiar fineness of ore structure, and it makes the property far less valuable than was formerly figured.

The Chandler and Pioneer, of the Vermilion range, are exceptions, their product holding well up and being of the finest. The Chandler, however, is fast exhausting its ore stores, and reduced outputs will be noted in a few years, unless new lenses are discovered. On the other hand, the Pioneer gives evidence of increasing in size for some years to come.

With the mining men fearing the Mesabi would swamp them, they are now seeking new ore deposits in Canadian soil, and already ore shipments from Michipicoten, on the Canadian side, have been commenced to the United States. There are said to be fine ores in Canada, although many of them are worthless, due to the titanium they hold. Some plan for the elimination of this will probably be found, but thus far it renders the ore unsalable.

The Michigan ranges have immense amounts of ores running better than 30 per cent and comparing favorably with the ores of the southern fields, but at the present there is little market for it. A few mines where the ores run high in silicon have developed a market in mixture with the finer grained ores of the Mesabi range, but the great bulk of these ores will remain untouched until the better grades have been disposed of. Furnacemen will wait until every pound of the better qualities is used up before buying the poorer unless the miners insist upon their accepting a certain portion of the lean with the fat. In some instances this is being attempted, and a few miners with exceptionally high grade ores have been enabled to sell some of their lower grades by refusing to sell the fancy without some of the ordinary.

In a few years, despite the great gains which have been made to former mining territory, there will be a cry for the fancy Bessemers which the consumers have been so persistently fed with of late, and to secure which more than one good mine was spoiled—[Iron Ore, Ishpeming, Mich.

THE IRON TRADE REVIEW
AND
INDUSTRIAL WORLD.

DEVOTED TO MACHINERY, METAL-WORKING AND FOUNDRY TRADES AND IRON AND STEEL MANUFACTURE.

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ADVANCES BY AGREEMENT.

Because the iron market has not kept up in the past 10 days the pace of the two or three weeks following the election, comment has come up here and there that the falling off may be due to the billet and plate pools. The fact is that the largest buying in November was in foundry pig iron, in which there was no sort of agreement. In billets and plates, after consumers had provided liberally for their needs, it was not to be expected that they would keep on buying. The same falling off in demand appears in foundry iron. Two consecutive months of such buying would have put the trade on the high road to a boom with all the hurtful characteristics of last year's. That the fact of a price agreement on billets and plates is not of necessity an explanation of any recent falling off in tonnage is indicated by the well sustained buying noticed of late in structural material which all along has been sold on an agreed basis.

It is well, however, to have emphasis put upon the close scrutiny to which the operations of all agreements among producers will be subjected in the new period of activity upon which the iron market has entered. There was a popular impression, uninformed and prejudiced though it was, that the formation of the consolidations and the maintenance of agreements like those on Bessemer pig iron, structural iron, bars and rails, were responsible to a considerable extent for the rapid advances in the market last year. The manufacturer who bought pig iron and finished material knew better, as a rule; but there was enough friction over high-priced contracts that required to be adjusted when the slump came, to leave some buyers in bad humor with their whole experience in 1899. Enough has been said in the past four weeks about the danger of getting prices up too far to put the entire trade on the alert for any evidence of an unhealthful movement, and under such circumstances the danger of mistakes is reduced to a minimum. So far as the billet price is concerned, it was believed by the companies interested that it represented no unwarranted advance, in view of the ore, coke and labor costs prevailing and, in the case of ore, at least, that will last for some months to come. We have reason to believe that the large steel producers are working together for the express purpose of preventing any advance that might be disastrous. The ore producers attempted, single-handed, in the early part of 1895 to keep the market from running away; but while their efforts certainly saved the ore trade from any embarrassment of large profits they did not have any effect upon the general situation. The companies that are now on a basis of conference with a view to conserving the interests of the entire trade, are so identified with the production of iron ore, pig iron, steel billets and finished material, as to be very influential in steadying the situation. The conditions in many particulars seem to be right for the maintenance of a fairly even market in the months just ahead. If the strong producers exert themselves to that end they may succeed in establishing a place in the thought of the consuming trade that they have not occupied thus far in their career. This much is certain, that buyers of iron and steel are more sensitive than ever on the matter of advances by agreement, particularly if these be out of harmony with products on which there is an open market.

NEED OF GREATER FOUNDRY EFFICIENCY.

One of the papers read at the recent New York meeting of the Society of Naval Architects and Marine Engineers was by Assistant Naval Constructor H. G. Gillmor, on "Recent Improvements in Foreign Shipbuilding Plants." In the discussion W. D. Forbes, of Hoboken, N. J., referred to the question of labor efficiency as an element in home and foreign shipbuilding costs. Among other things he said:

"I look for a very great advance in cheapening products, especially for large engines, in the foundry. There is the place we are not doing the work we ought. I find that—turning to the pay of the men—if a man is getting $2.50 from me and he knows that if his work equals a $3 man he is going to get it, and that some one is keeping an accurate account of the work he does, that man is always pushing himself to get the $3 a day."

But there is an influence steadily exerted to eliminate such an incentive. We refer to the policy of some of the labor unions in obstructing the development of trade by dissociating compensation and amount of work done. In most cases this takes the form of opposition to piece work, whether on the old-fashioned plan or under the more recent modifications tending to prevent over-exaction by "labor-drivers" and give the industrious and expert operative his full due. This question is really the main contention today between shop employers and their workmen; other issues quickly lose themselves in this one. Wage advances could be readily granted in many a shop, if the employer were given assurance that his men would cooperate in developing the best possibilities of the equipment provided.

That the foundry has not kept pace with the machnie shop in the adoption of methods and appli-

ances for cheapening product is a proposition on which there will be plenty of affirmative testimony. Mr. Fobes as an expert whose utterances have had and are entitled to weight says squarely that the foundry is the place where results are not being secured as they should be. It is right to look to the attitude of organized labor in the foundry, in the effort to discover the cause. If fairminded men, who have no controversy on with their foundry employes, are convinced that conditions need righting, it is time for the leaders of labor to give some heed to the considerations urged. Writing in the *Engineering Magazine*, on "Piece Work as an Agency in Machine Shop Cost Reduction," M. Cokely, who has had much experience as expert and superintendent in systematizing and organizing shop work, makes some points that are thoroughly practical and pertinent:

"Labor organizations are certainly working on the wrong principle when they encourage their members to retard production by the performance of a dishonest day's work. They are no doubt honest in their convictions, but blind to the inevitable nevertheless. President Fox struck the nail on the head when he advised the Iron Molders' Union to cease opposition to molding machines. Suppose that advice had been given years ago, when molding machines were first introduced; or suppose there never had been opposition, but, on the contrary, the men had recognized the inevitable and accepted the machines as a benefit to the foundry business and the world in general, and endeavored to make the best use they could of them!

. . . "While in conversation with me, a labor leader cited in support of the machinists' union the extraordinary wages received by the locomotive engineers. He seemed to attribute this to the mere fact of organization. He did not seem to recognize the fact that a large number of the machinists object to running machine tools at the feeds and speeds which the manufacturer considers necessary to realize a fair return for his investment in the machines. Who ever heard of an engineer deliberately reducing the speed of his engine below the rate at which the railroad company decided it should be run? On the contrary, they accept the speeds cut out for them, and instead of reducing the efficiency of their machines, under the mistaken notion that it will afford employment to a greater number, with their life in their hand they push them up to the prescribed limit and take a pride in their performance. Such men, in my opinion, richly deserve every dollar they receive. I will admit that organization has contributed to their success, but it is organization of a kind which other unions might copy with profit. All mechanical development is toward an intensified production, because the wants of civilization demand it, and every obstruction which we place in the path of that development only adds to our burdens unnecessarily. We should not antagonize honorable means or methods by which production is intensified, because, on the whole, it is for man's benefit. We notice this in the continual shortening of the hours of labor. Do not think for a moment that the blessing of shorter hours is the result of organized labor's demands only—not by any means. The prime factor in its realization is the use which has been made of labor-saving machines and methods in promoting and reducing the cost of production. Brains came to the relief of muscle, and will continue to do so; therefore it is detrimental to the interest of labor to discourage or prohibit the use of such improvements."

HEAVY IRON AND STEEL EXPORTS.

A good illustration of the facility with which the iron trade changes front is found in the record-breaking shipments abroad from furnaces and steel works simultaneously with a sudden falling off of new business for export. The October export figures indicate that the sales of pig iron and steel from the United States made last summer when conditions here were at a low ebb, amounted to much more than was commonly supposed. The table below shows a surprising jump in pig iron shipments in October, that month establishing the record at 65,182 tons, or five times the amount for October, 1899. The efforts of Central Western steel works and bar mills in the summer months also bore fruit, shipments of billets and sheet bars being particularly heavy. A total of 23,599 tons for October is in decided contrast with 18 tons under the prohibitory prices for steel in 1899. It will be seen that the total movement for the month in the materials given below was double that in October, 1899:

EXPORTS OF IRON AND STEEL FROM THE UNITED STATES.

Gross Tons.

	Oct.		Jan'y—Oct.	
	1899	1900	1899	1900
Pig iron { ferro	.....	.....	13	16
Pig iron { all other	13,312	65,182	207,707	227,580
Scrap	1,647	6,274	72,264	43,362
Bar iron	8 6	1,173	10,048	7,668
Wire rods	1,039	2, 08	15,640	7,497
Steel bars (not wire rods)	1,948	11,034	26,025	61,618
Iron rails	240	29	5,449	5,214
Steel rails	37,051	36,599	223,148	335,525
Billets, ingots and blooms	18	23,599	24,641	70,845
Hoop, band and scroll iron	104	680	2,388	1,999
Iron sheets and plates	367	661	5,180	7,402
Steel sheets and plates	5,468	5,619	12,755	32,531
Tin plates, terne plates, and tagger's tin	18	8	115	21
Structural material	4,240	4,104	47,476	54,561
Wire	11,368	6,499	97,806	65,626
Cut nails	483	626	8,162	9,149
Wire nails	2,188	1,303	25,242	24,227
Other nails, including tacks	127	159	1,799	1,570
	80,654	165,648	785,949	945,811

October exports of iron and steel and machinery are valued at $12,179,237, as compared with $9,598,000 for October, 1899. For 10 months the total was $109,492,297, as compared with $86,167,205 to Oct. 31, 1899, and $67,290,560 for the first 10 months of 1898.

PERSONAL.

Benjamin Talbot, of the Pencoyd Iron Works, of Philadelphia, and inventor of the Talbot continuous open-hearth steel process, was in Pittsburg last week accompanied by Robert Armitage and John M. King, members of the Brown, Bailey & Dickson Co., of Sheffield, Eng., manufacturers of steel specialties. They visited the steel plants in the Pittsburg district.

A. D. Dorman, Western manager of the Union Drawn Steel Co., Alfred Marshall of the Marshall and Huschart Machinery Co., and W. A. Jones, the veteran Chicago foundryman of North Ave. and Noble St., have just returned from an eight weeks hunting trip after big game in the Jackson's Hole district in Wyoming. The party had a very pleasant and successful trip, and secured a large quantity of game, including elk, deer, antelope, bear and coyote, to say nothing of smaller game and mountain trout.

Herbert E. Goodman general manager of the Goodman Mfg. Co., Chicago, was seriously injured Nov. 27 in an accident in a coal mine near Altoona, Pa., Mr. Goodman with others had been inspecting machinery in the mine when a car above them broke loose and came down the track. It was only through the warning and coolness of Mr. Goodman that several of the members of the party were saved from death or serious injury, and in forcing them out of the path he was struck and his right leg so badly crushed that it was necessary to amputate it above the knee.

George T. Oliver, the well-known iron master of Pittsburg, owner of the Pittsburg *Commercial Gazette*, announced last week that he had purchased a controlling interest in the Pittsburg *Chronicle Telegraph*, and that in the near future the two papers morning and afternoon respectively, would be issued from one plant.

Samuel Siddall, formerly of the Union Iron & Steel Co., Youngstown, O., also of Jos. T. Ryerson & Son, Chicago, has been appointed by the American Steel Hoop Co. as district sales agent with headquarters in the Chamber of Commerce Bldg. at Cincinnati, vice B. F. Harper, resigned, who goes with the Republic Iron & Steel Co.

THE Niles (O.) Iron & Sheet Co., has organized as follows: Directors, John Anderson, W. A. Thomas, John E. McVey, H. M. Robinson and William Cunneck; president, James Patterson; vice president, H. M. Robinson; secretary and treasurer, W. A. Thomas. Mr. Patterson was formerly superintendent of the Struthers mill. The new plant will be a steel frame structure, 124x200 feet, with a 15-ton traveling electric crane.

NOTES ON FOUNDRY COKE.*

The melting of iron in the foundry differs considerably from the reduction of the metal from its ore, and the cupolas or furnaces used in the various foundries differ considerably in construction. With a smelting furnace one has to keep up with the times or close down, whereas in the ordinary foundry, melting metal is only a minor part of the expenditure, molders' wages, as a rule, being the chief cost. It therefore follows that any and every arrangement of cupola is to be found; and so long as melting can be done, usually that is sufficient, excessive coke consumption being blamed to the poor quality of the coke, while the greatest probability is that the furnace arrangements are bad, and thus cause the trouble Usually in all the old cupolas the tuyeres are too small, and the air pressure too high, when instead of having a melting zone of intense heat, there will be found that only part of the zone is in this condition, the furnace "blowing cold" as the firemen put it. To get the most out of your fuel you want an abundance of wind at a low pressure, and with a belted cupola you want the belt large enough to supply the tuyeres without excessive forcing.

Coming to the coke itself, freedom from sulphur is very necessary, as the sulphur is largely taken up by the iron, thus reducing the chances of obtaining soft castings very considerably. The coke should necessarily be close grained, and hard; but the question of brightness is not always a sure test as to quality, washed coal carbonized in the modern coking plants very frequently not being anything near so bright and silvery as that from the old beehive ovens, and yet it is as good. Brittle coke which falls very easily into small fragments makes a bad foundry coke, because it wastes in breaking, and in the furnace is apt to disintegrate quickly, the "bed" being rapidly lost, and melting seriously hindered or stopped from this reason. Too soft a coke will serve one in the same way, and instead of getting the iron down in a really fluid state, it comes pretty nearly as thick as black treacle. With hard coke you cannot well lose the "bed" or get sluggish metal, unless by sheer carelessness or neglect—a matter that should appear very easy to remedy in practice.

Good foundry coke should be free from anything passing a 1½-inch ring, should require a heavy blow to break it, and while of even texture should be free from rusty or metallic-looking stains. For economy it should be quite dry when purchased, and in a dry state should have a somewhat metallic ring when struck together; but in this, coke made from washed slack and carbonized in modern ovens will usually have a less resonant ring than that made in the old beehive ovens. Color cannot be depended on as a guide to quality, for while the old system of coking produced a silvery coke, the new ovens do not produce this silvery appearance, although the coke is quite as good for melting purposes. The way to secure the best for furnace work is to buy of some agent of good repute, and as a general rule you then get well served.

Gas coke is of no use under a blast, as it is too soft. It can be used for brass furnaces where brass and other soft metals are being dealt with, but with iron it is very expensive even when thus used, as it takes about 1 cwt. of furnace coke against from 2½ to 3 cwt. of gas coke to melt a given weight of iron, and as the former in London is only 36s. per ton, while gas coke is 20s. per ton, the difference is easily calculated.

Gas carbon—retort scurf—is a cheap fuel to mix with some of the softer furnace cokes when it can be had at a reasonable price, say anywhere under 40s. per ton; but it is rather lively, and whoever is on the charging platform must be careful when using it, or burns will be pretty frequent.

The coke necessary for melting a ton of iron is a very variable quantity, for while theoretically somewhere about 40 pounds should be enough, after making allowance for inert substances combined with the fuel, in practice very much more is required, and in some cases the writer has found that nearly 400 pounds per ton has actually been used. During the last four or five years the writer has melted about 300 tons of high-carbon steel, and very nearly 1,000 tons of iron, and with very careful working has found that the steel took 650 pounds of coke per ton, and iron—about equal parts of medium scrap and hematite pig—107 pounds of coke per ton, although at times an average of 90 pounds was maintained. The coke varied considerably, and the cupola was not one of the best, but still the fuel could not afford cause for serious complaint if all circumstances are taken into consideration. In fact, if the coke consumption of an ordinary foundry cupola can be kept at an average of 160 pounds per ton of iron melted, there should be little cause for complaint; but in addition to this there will be waste, and usually this waste is the cause of heavy coke accounts, for although the small waste coke not used in the cupalo will probably be used in the core ovens, and maybe occasionally in the brass furnaces, the whole weight will usually be charged to the cupola, thus possibly adding another 40 or 50 pounds per ton on the iron melted. For this reason large coke should always be stipulated for, as the best size for use is that which passes a 9-inch ring and is retained by one 3 inches in diameter, although some slightly smaller pieces are sure to occur. Purchasing wet coke is also a disadvantage, as it is easy to get quite 10 per cent of water, which, to say the least, is an expensive method of purchasing this useful commodity. With ordinary care and the usual commercial ability to carry on work, 160 pounds of coke per ton of iron melted should be a good average for the usual run of the ordinary foundry.

* W. J. May, in London *Mechanical World*.

LAKE SUPERIOR IRON MINES.

The Oliver Iron Mining Co. expects to mine and ship from the Iron River district in 1901 about 250,000 tons of ore. This with the shipments that will be made by the Victor Schlitz Mining Co. and the Menominee Exploration Co. will probably make a total shipment of 325,000 tons from the district. The Oliver Iron Mining Co. will reopen the Isabella mine which has been idle since 1892. It was at first worked as an open pit to a depth of 200 feet. The ore pitches to the south toward the Dober mine. It averages about 60 per cent in iron and 33 per cent in phosphorus.

The shipments from the Fayal mine next year will probably be greater than for this year. The mine is constantly being enlarged. About 800 men were employed this season. In addition 400 to 500 men were engaged in stripping and enlarging the open pit. A brick machine shop, over 200 ft. long, and using the latest and best tools, has been built.

The Spruce mine on the Mesabi range ended its first year with a shipment of 110 000 tons. Two shafts have been sunk, good buildings erected, the best machinery installed, and the property extensively opened. It is in shape to mine at least 350,000 tons next year. It is a producer of high grade Bessemer ore, and has a reserve of 7,000,000 tons or more.

The Adams mine, Eveleth, Minn., closed the season with an output from five shafts of 775,000 tons. This is the first year the Adams has been an entirely underground property, an open pit to the east of the shafts having furnished some tonnage in 1898 and 1899. The mine is underground henceforward.

At the West Colby mine which adjoins the Colby at Bessemer, Mich., a body of ore has been found that is reported to be very promising both as to quantity and quality. Work has been carried on for the past few years, with no great results until now. The mine is owned by W. H. Hinkle, of the Ashland Iron & Steel Co. and William Werder, both of Ashland.

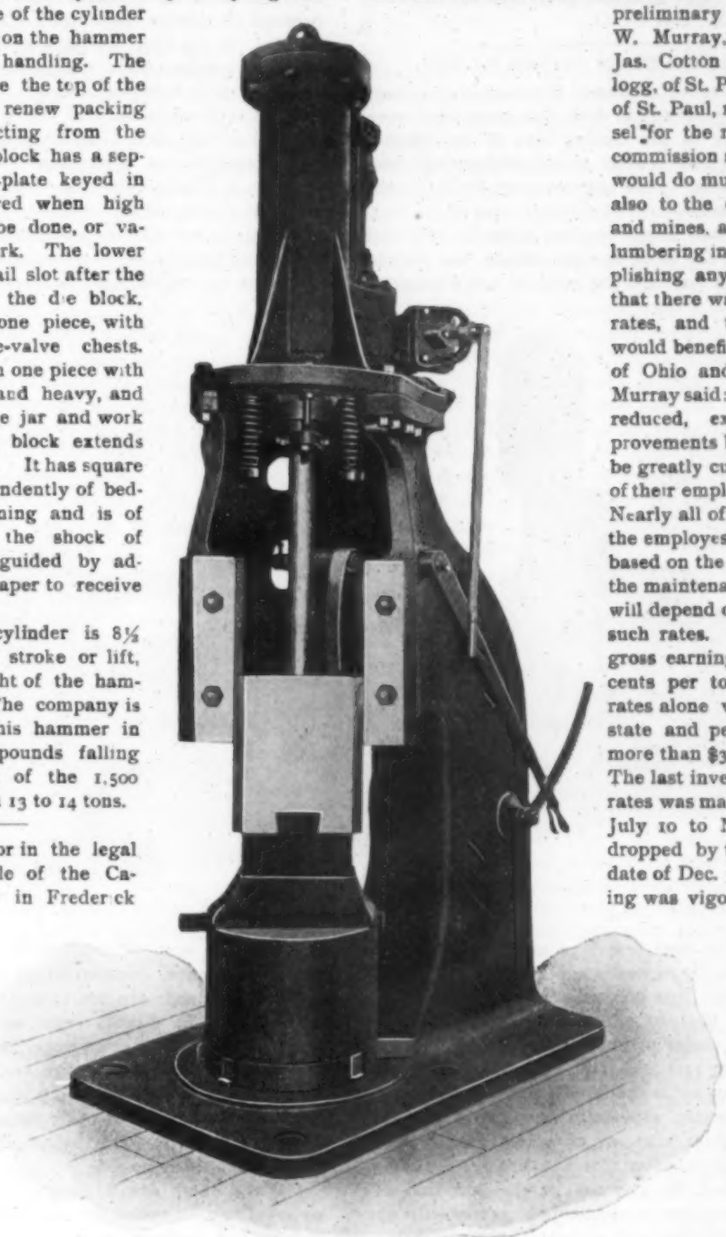
THE stock formerly held in the Miller Improved Gas Engine Co., of Springfield O., by M. L. Milligan and P. Young has been purchased by C. H. Over, L. F. Over and Dr. A. F. Smith. The company will be shortly capitalized at $65,000 or $75,000 and a new and modern plant will be erected at a site to be decided upon shortly. It is probable that the plant will remain in Springfield, although flattering offers have been received from Columbus for the removal of the plant to that city. Agencies for the sale of the Miller gas engine will be established throughout the country.

THE Akron Engineering Co., Akron, O., whose incorporation is referred to elsewhere, is in the market for cupola and cranes for its projected foundry. In the near future the company will take up the matter of pattern and machine shop equipment.

850-POUND SLIDE HAMMER.

Bell's Steam Engine Works, of Buffalo, manufacture an 850-pound steam hammer, a view of which is given herewith. The hammer is double-acting, taking steam at top and bottom of stroke, and runs either automatically or by hand giving a considerable range in length, position and force of blow. The ram and guides are set diagonally with the frame, at the proper angle, to permit of drawing and finishing. The valve is of the piston type, balanced, and steam and exhaust pipes have expansion or stuffing box joints. The valve gear is simple, and any variation is produced by the action of a single lever after throttle valve has been opened. Spiral springs are fastened to the under side of the cylinder flange for safety to cush on the hammer head in case of careless handling. The piston can be raised above the top of the cylinder to examine or renew packing rings without disconnecting from the hammer head. The die block has a separate piece above the bed-plate keyed in place and easily removed when high work like upsetting is to be done, or various kinds of shape work. The lower die fits in the lower dovetail slot after the removal of the top cap of the die block. The cylinder casting is in one piece, with piston-valve and throttle-valve chests. The main casting, being in one piece with the bed-plate, is strong and heavy, and proportioned to stand the jar and work of hammer, and the die block extends down below the bed-plate. It has square base, being fitted independently of bed-plate and kept from turning and is of ample weight to absorb the shock of the blow. The ram is guided by adjustable slides and bored taper to receive the piston rod.

The diameter of the cylinder is 8¼ inches and the length of stroke or lift, 24 inches. The total height of the hammer is 10 feet 3 inches. The company is also preparing to build this hammer in sizes of 1,100 and 1,500 pounds falling weight, the total weight of the 1,500 pound machine being from 13 to 14 tons.



850-POUND SLIDE HAMMER.

Owing to a technical error in the legal papers authorizing the sale of the Catoctin Furnace property in Frederick county, Md., owned and operated at present by the Blue Mountain Iron & Steel Co., the sale which was to have taken place on Nov. 22, has been indefinitely postponed. The property consists of 7,000 acres of property in Frederick county and elsewhere. The receivers of the Catoctin Mountain Iron Co. hold a mortgage on the property for $20,000. The property some time ago was sold for $30,000, and later transferred to the Blue Mountain Iron & Steel Co., capitalized at $580,000. There has been a payment of $6,000 on the mortgage since the transfer was made.

The new Bessemer steel plant of the Republic Iron & Steel Co., Youngstown, O., will be put on double turn this month.

The W. J. Clark Co., of Salem, O., manufactures among other specialties, a patented suction hose coupling known as the "Quick as Wink" coupling. It is stated that there are many towns in which the water pressure is not sufficient at the hydrant to supply steam fire engines, and the big armored suction hose that must be used is not easily or quickly connected by one or two men with the common couplings. The new invention is designed to meet these conditions.

Iron Ore Freights in Minnesota.

The preliminary hearing before the Minnesota State Railroad and Warehouse Commission on the present rates for iron ore transportation from the Vermillion and Mesabi ranges was held Nov. 23, and Dec. 3 was set for the hearing of testimony. Three railroads are concerned: The Duluth, Missabe & Northern, the Duluth & Iron Range, and the Eastern Minnesota. The roads were represented at the preliminary hearing by Geo. W. Murray, of New York, and Jas. Cotton of Duluth; F. B. Kellogg, of St. Paul; and M. D Grover, of St. Paul, respectively. The counsel for the roads argued that if the commission should reduce rates it would do much injury to the state, also to the employes of railroads and mines, and to mine owners and lumbering interests, without accomplishing any good. It was stated that there was no discrimination in rates, and that cutting the rates would benefit only the furnacemen of Ohio and Pennsylvania. Mr. Murray said: "If the ore rates are reduced, extensive railroad improvements by the ore carriers will be greatly curtailed and the wages of their employes certainly lowered. Nearly all of the wage schedules of the employes of this company are based on the existing ore rates, and the maintenance of such schedules will depend on the continuance of such rates. Based on the present gross earnings, a reduction of 10 cents per ton in the existing ore rates alone will mean a loss to the state and people of Minnesota of more than $30 000 a year in taxes." The last investigation into iron ore rates was made in 1898, lasting from July 10 to Nov. 29, and was then dropped by the commission. The date of Dec. 3 set for the new hearing was vigorously opposed by the roads, as leaving too short a time for preparation.

Of all the large amount of machinery and equipment taken to the Paris Exposition by the J. A. Fay & Egan Co., of Cincinnati, O., there will be practically nothing of it left to bring home. The amount realized from the sale of the machinery and equipment is estimated at about $50,000. Mr. Egan stated that the exhibit of the company's machines was the means of selling upwards of $250,000 worth of machinery abroad.

The American Bridge Co will not complete the big bridge plant under erection at Economy, Pa., by the Berlin Bridge Co., when the bridge combination was formed. The abandonment of this site is another step towards the centralization of plant in the Pittsburg district. A portion of the machinery intended for the Economy works has been sent to the Youngstown plant of the combine. The latter will be enlarged, according to reliable reports.

SMITH-VAILE PRESSURE FEED PUMP.

We present an illustration below of the Smith-Vaile pressure feed pump, provided with outside central packed water plungers. The plungers are double-acting reciprocating through deep packing glands. The water box is designed for a working pressure of 300 pounds per square inch. The suction valves are located below the plungers; the discharge valves above, admitting of the passage of water through the box in the most direct line and with the least internal friction possible. The valve seats, stems and springs are of phosphor-bronze. The water valves are of composition rubber or bronze as preferred. The manufacturers are the Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

Lake Freights and the Better Outlook for Iron.

It is certainly fortunate for the vessel interests of the great lakes that conditions generally in iron and steel lines have changed for the better in the closing days of navigation. Sales of pig iron during the present month will probably exceed all previous records. This improvement is, of course, of no value for the season of navigation now at an end, although it probably had some bearing upon the few final cargoes of iron ore that are being brought down, and for the movement of which $1 a ton from the head of Lake Superior has been paid within the past few days, as against a 60-cent rate that prevailed a couple of weeks ago. But if the present healthy condition of the iron market continues through the winter, it will have a decided effect upon lake freights. A week or two ago the vessel owner could see nothing more than 60 cents a ton for 1901 lake freight ore contracts, and that rate he could not accept without radical reductions from present operating expenses, especially as regards handling charges. It was evident that an effort to reduce these charges would mean serious labor troubles, but now an active iron market may warrant the payment of freights that will not require radical reductions in operating expenses. In any event, it would seem that the only policy for the vessel owners at present is to avoid hurrying contracts for another year's business.—[Marine Review, Nov. 22.

MEMBERS of the Amalgamated Association of Iron, Steel and Tin Workers are agitating an advance in the dues of members. It is said that had a strike been declared last summer the association treasury would have soon been depleted. The call now is for a $1,000,000 treasury in order that a strike can be carried on if need be.

SEEBOHM & DIEKSTAHL, Ltd., Sheffield, Eng., deny the report that they are about to move their plant to the United States. The company is considering the erection of an additional plant on this side, and has secured the necessary option on the land. The plant in England will continue.

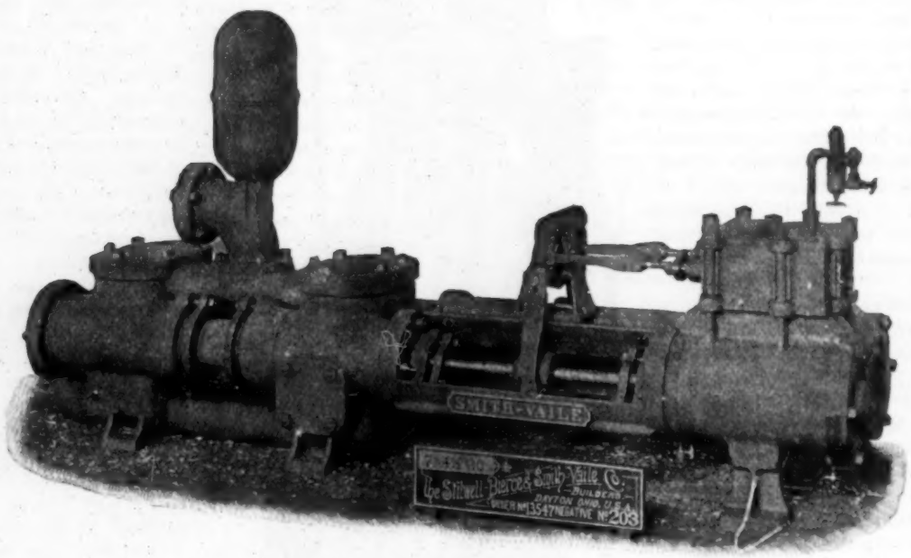
A CONTINUOUS ROLLING MILL SCALE.

It is stated that Central Western iron manufacturers have had under consideration the subject of a continuous wage scale and in January will present some suggestions for the consideration of the Amalgamated Association officials. In the Youngstown, O., *Vindicator* of Nov. 25, James H. Nutt, who is in charge of the labor bureau of the Republic Iron & Steel Co., wrote as follows on this subject:

"The methods employed by the Amalgamated Association in the adjustment of wages is practically the same as it has been since the association was formed in 1876, while the business interests have made rapid changes, which seem to demand changes in the method of settling the wage question. Besides, for the best interests of the community which is so largely dependent upon iron and steel, a possibility of a prolonged dispute is one of serious moment not only to the ironworkers themselves but also the business men generally. In order to obviate this, I believe a method can be devised that would provide for continuous operation of the mills. For instance in England the ironworkers and employers appoint an equal number of representatives who decide what the base rate shall be and also the percentage of advance or decline as the selling price of iron fluctuates, either up or down. These questions are settled upon a business basis by the employer showing the cost of production and the selling price of the material, thereby demonstrating to the workers whether or not their demands are justifiable. They further provide that all questions in dispute must be referred to this board and under all circumstances work must be continued pending investigation, and in case the two committees are unable to agree, the point or points in dispute are submitted to an arbitrator that has previously been agreed upon, both parties having agreed to abide by his decision, the possibility of a strike has been removed.

"While there are a great many good people who are opposed to even voluntary arbitration, yet under this method it is seldom resorted to because each party knowing that if they fail to agree it must be referred to some disinterested party who will decide the question, both sides are more careful as to their demands, and neither side will insist upon them unless they feel that facts and figures will bear out their contention.

"A method somewhat similar to this has been in successful operation for six or seven years between the Illinois Steel Co. and its employes at the south works, during which time they have worked in perfect harmony, and so far as I know they have never found it necessary to call in any one to decide any point upon which they have failed to agree. The employes of this company are members of the Amalgamated Association, and if it has worked to the satisfaction of all in this case it can be made to work quite successfully in all other branches of the iron and steel trades, provided both sides to the controversy are anxious to arrive at a fair and equitable adjustment of the questions in dispute."



SMITH-VAILE PRESSURE FEED PUMP.

RECOVERY AND USE OF SHOT IRON.*

BY E. H. PUTNAM. MOLINE, ILL.

In most foundries there is a constant and heavy waste of iron, day by day, year after year, while, strange as it may seem, the founder is in many cases totally unaware of the fact; and those who realize that there is a waste are in entire ignorance of its magnitude. We have been taught that the small particles of iron that escape from the tumbling mill, and are thrown out with the refuse, are not in any true sense waste, for it is claimed this iron is of no real value, as it will not mix, and it has a hardening effect upon the mixture.

I have recently learned that there is a much greater quantity of iron thrown away than I had suspected, and that though it does harden the mixture to some extent this is not sufficient to preclude the possibility of its economical consumption. I am aware that some writers on foundry practice aver that there is no economy in using it; that, as noticed above, it hardens the mixture, and that much of it is burnt up and so destroyed. While it is quite probable that some of the very thin, light particles are indeed consumed in the remelting, it is nevertheless certain that the greater part melts and mixes with the other iron. This I know, for I have tested the matter by melting a quantity by itself, weighing it into the cupola, and afterwards weighing the product, the latter being 90 per cent of the amount charged. The shrinkage in some kinds of pig iron will equal this.

Our method is as follows: We pass the cupola cinders through the tumbling mill, as has always been our custom, continuing the tumbling until the cinders are thoroughly crushed, and everything but the iron has sifted out between the staves, which in our practice fit rather closely, for the purpose of saving as much iron as possible by this process. Now, the refuse dust and fine cinder, which formerly was dumped out as being entirely worthless, is passed through the magnetic separator; and the amount daily recovered from the dump of two cupolas is something in excess of 550 pounds of iron, which will yield 500 pounds after sifting, or 450 pounds after remelting The product when melted by itself is a strongly mottled pig. But as this shot iron is distributed throughout the heat, as mixed in the daily cast, its hardening effect is very slight and in a well ordered mixture cannot be detected in any but very light thin castings.

But you cannot use this shot iron in all mixtures, any more than that you can use certain pig irons in all mixtures. If you are going to use the shot iron regularly, the pig mixture must be regulated with this fact in view. When we first began using this shot iron, we had some No. 2 soft charcoal iron which we were using in the regular soft iron mixture, and we had no trouble whatever. Later, the charcoal iron having been all consumed, we made a mixture of all coke iron, employing, of course, the usual quantity of scrap (50 per cent, which includes our shop remelt), with the result that the light castings were altogether too hard for drilling. There were but few of these castings made, and they were thrown into the scrap.

In the process that I immediately began and prosecuted to a conclusion may be seen the method of a branch of the "rule of thumb" foundry practice. The shot iron was left out entirely and the balance of the mixture made as before. A few of the light castings only were made, and these were cast at different parts of the heat. Result, too hard for the light castings that had to be drilled, but all right for the balance. There were three different numbers of pig iron in the mixture, viz.: No. 2 soft, Southern; No. 2 foundry, Southern; and No. 1, Northern. The two former were from an unfamiliar furnace. So the per cent of No. 2 foundry was diminished, with good result. Cutting down of the No. 2 foundry was continued until that brand was entirely eliminated, and even then the product was not so soft as to enable the use of the shot iron in the light castings. During the process we had also changed the per cent of No. 1 iron in the mixture, to correct shrinkage. The loss consequent upon the "rule of thumb" method of correcting our mixture would amount in money to very little Now we omitted the shot iron from the first 7 000 pounds charged in the cupola, which enabled us to cast the light work before the mixture containing the shot iron came down. As the No. 2 foundry iron was too hard for our use, except in the heavier castings, we bought from a different furnace, and now we are again using the shot iron without difficulty.

We have had no difficulty consequent upon the use of the shot iron, except in the matter of hardness. To overcome this, it is only necessary to use a sufficiently soft pig iron in the mixture. We have not been obliged to use any specially soft iron in the mixture—just ordinary No. 2 soft, No. 2 foundry and No. 1 foundry—the same brands that we were using before we began melting the shot iron. The actual saving in our case is, say, 450 pounds of iron per day at 67c= $3 per day.

The time consumed in operating the separator must be considered, of course; but this is so trivial that no additional labor is employed, the work of running the separator having been added to the duties of the laborers who work about the cupola.

The magnetic separator that we use is one that Messrs. Barnard & Leas, of Moline, Ill., invented and perfected during the past year, and which they are now manufacturing for the trade. I do not wish to make any invidious comparisons between this machine and other machines manufactured for the like purpose; however, a general description of it may not be out of place. The machine is in shape essentially a cylinder, wound with copper wire which in operation is charged with electricity. This cylinder is set in the frame at an incline that will cause the cinders to pass through, from the one end where they are charged out at the other, the magnetized inner surface of the cylinder catching and holding fast every particle of iron. It might seem, at first thought, that some of the iron particles would get brushed out with the dust and coke cinders; but it should be borne in mind that the iron in contact with the cylinder is itself magnetized, and therefore holds firmly any iron that comes in contact with it. When the current is thrown off the iron "lets go" from the cylinder and pours out into the receptacle. The work of operating this machine is as simple and easy as running a power sand sifter. Cost of current for the machine is less than 2 cents per hour, and one hour's labor will run the day's product through. The machine weighs about 1,100 pounds, and occupies a floor space of 2.5x10 feet.

In conclusion, I wish to state that the saving effected by us is less by a good deal than what it would be in foundries where extraordinary care is not taken to extract the iron from the cinders, by having close-fitting staves in the cinder-mill. In fact it is quite obvious that, in view of the difference in the care taken in various foundries in this respect, the saving by the use of the separator in some foundries would be two or three times what it is with us. One very important point to bear in mind is that, no matter how large or how small the pieces of iron, none can escape the vigilance of the machine. So that, if the operator of your cinder-mill becomes careless, permitting wide spaces between the staves, which will pass large pieces of iron, that would ordinarily go to the dump, the magnetic separator will catch this iron and save it for you. It is our intention to provide wider spaces between the mill staves, so as to obviate the necessity for so much grinding in order to reduce the cinder. This will save somewhat of time and wear of machinery, without any loss of thoroughness in the extraction of the iron.

* Prepared for the December, 1900, meeting of the Foundrymen's Association.

THE continuous open-hearth process of Benj. Talbot, of Pencoyd, Pa., is making headway in England. A London exchange says that the prospectus of the English company will be issued soon. The matter is in the hands of Mr. H. Le Neve Foster, of Birmingham, Eng., who has succeeded in forming a strong board. The capital of the new company will be £300,000. Licenses to work the Talbot process have been taken out by the Weardale Coal & Iron Co., the Mossbay Hematite Iron Co., and the Northeastern Steel Co.

RICHARD G. WOOD, of the American Sheet Steel Co., has emphatically denied the report that the W. DeWees Wood interests of the American Sheet Steel Co. were attempting to withdraw from the combination He further denied that any effort is being made to organize an opposition sheet mill in which he is to be largely interested.

A NEW RECORDING AIR PYROMETER.*

BY WM. H. BRISTOL, HOBOKEN, N. J.

The instrument herein described has been designed to meet a demand for a pyrometer to measure temperatures of high ranges, and to give continuous records of changes of such temperatures on a moving chart; also to produce an instrument which would be self-compensating for barometric and thermometric changes of the atmosphere without introducing delicate mechanism which would tend to inaccuracy and to preclude its use for commercial purposes. The diagram, Fig. 1, shows the arrangement of the parts of the pyrometer, which consist simply of a porcelain bulb connected by a capillary tube to a recording pressure gauge. The stem of the porcelain bulb is made of sufficient length to pass through the furnace wall. The capillary connecting tube is made of seamless copper. The recording pressure gauge employed is constructed on the same plan as those previously described. [Transactions A. S. M. S., p. 225, paper No. 368.] By reference to the description it will be found that each pressure tube or spring is constructed on the Bourdon principle, and consists of a tube of closely flattened cross-section formed into a helix of two complete turns.

Two of these pressure tubes or springs are employed in the recorder—one of these, the indicating tube or spring, being connected to the air bulb by the capillary tube, and adapted to be turned axially by the variations of pressure due to changes of the temperature to be measured; the other, a compensating spring, is mechanically attached to the free end of the indicating tube or spring. The compensating spring is adapted to be turned axially by variations of atmospheric

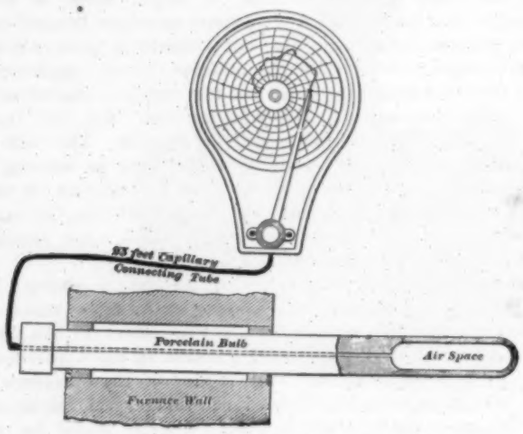


FIG. 1.

pressure and temperature in a direction opposite to the motion of the first or indicating spring under the same influences.

Fig. 2 shows an interior view of the recording portion of the instrument. The compensating and pressure tubes are lettered respectively A and B. These tubes are made of equal strength, hence external or internal pressure will produce the same angular movement in each. The air bulb, capillary connecting tube, and indicating spring, are almost exhausted of air, so that when the air bulb is cold, it is subjected on the exterior to nearly atmospheric pressure; but when the bulb is exposed to high temperatures, the remaining inclosed air is expanded so as to practically balance the external pressure, and the bulb is relieved of strains which would, in its weakened condition, tend to injure it.

Fig. 3 shows the indicating and compensating springs of the recorder on an enlarged scale. C is the bracket to which one end of the indicating spring B is secured; D represents a portion of the capillary connecting tube where it enters the stationary end of the indicating spring. The compensating spring A is helically formed in the same direction as the indicating spring, but of a larger diameter, so that it may be placed outside of and concentric with the indicating spring, as shown, and is mechanically attached at E, there being no opening or connection between the interiors of the two springs. At the free end of the compensating spring a bracket F is soldered, making a rigid connection to a shaft through the center of the springs. At the front end of the shaft the recording arm G is rigidly secured.

To illustrate the operation of the compensating spring, assume that the air has been partially exhausted from it,

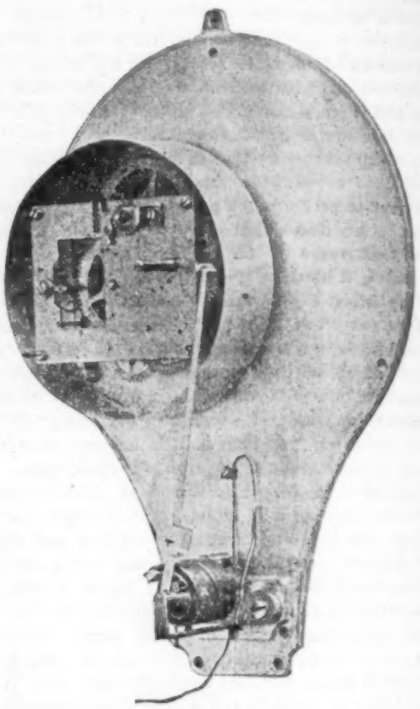


FIG. 2.

and that the barometer rises under such a condition the indicating spring would turn to the left, (Fig. 3), if the compensating spring was not present; that is, in direction of arrow 1; but the compensating spring A being present and tending to turn to the right, as indicated by arrow 2, through the same angle, the effect of changes in atmospheric pressure is neutralized, and the position of the recording arm is unaffected by the rise of atmospheric pressure. For the same reasons there would be no movement of the recording arm when there is a fall in atmospheric pressure.

If the air is not entirely exhausted from the compensating spring, it will also compensate for thermometric changes in

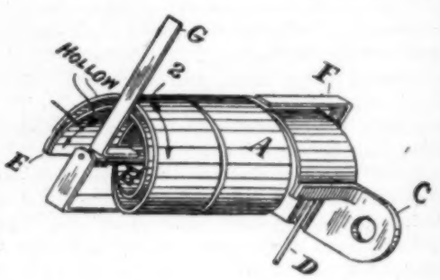


FIG. 3.

the same manner, the indicating spring tending to turn in the direction of arrow 1 when the temperature falls, and in the direction of arrow 2 when it rises; while the compensating tube will be turned in opposite directions equal amounts under the same influences. By leaving the proper amount of air in the compensating spring the compensation may be made perfect for any change of atmospheric temperature, provided the air bulb is at a given temperature. The error for small variations from the average temperature to be measured will be so small that it may be neglected. As the tubes are turned in opposite directions by barometric and thermometric changes, it is evident that there will be no movement of the recording arm unless due to changes of

* Read at the New York meeting, December, 1900, of the American Society of Mechanical Engineers.

pressure communicated to the indicating spring through the capillary tube from the air bulb exposed to the temperature to be measured. The helically formed pressure springs are particularly well adapted for use in this instrument on account of the small internal space, which, together with that of the capillary connecting tube, forms a small volume in comparison with that of the air bulb.

Thus far, special attention has been given to working out the mechanical features of the instrument, and to determine experimentally on the most practical form of the porcelain air bulb, and how these bulbs may be applied to continuously record high temperatures. As the volume of air space outside of that exposed to the temperature to be measured is very small, and as there are no corrections or computations necessary for barometric or thermometric changes, it will be a simple matter to calibrate the instrument according to the theory of the air thermometer, which is a recognized standard for measuring temperatures. The instrument here exhibited has been calibrated by comparison with a standard from 32 degrees up to 600 degrees Fahr., and by the melting points of aluminum and copper for the scale up to 2,000 degrees Fahr. This instrument is the joint invention of E. H. Bristol and the author.

THE United States Cast Iron Pipe & Foundry Co. will move its headquarters from Chicago to New York City. It is understood that the offices will be located at 80 Broadway, where the New York office is now located. The company believes operations can be more easily and advantageously directed from the metropolis. The company passed the dividend on its preferred stock at a recent meeting.

The wages of the 12-hour day men at the Mingo Junction, O., plant of the National Steel Co., have been reduced from $1.74 to $1.60 per day.

The Robb Engineering Co., of Worcester, Mass., is building a 250 h. p. engine for shipment to Calcutta, India.

A METHOD OF STRENGTHENING GEAR TEETH.

A patent has just been issued to Geo. H. Boyd and Thos. D. West, of Sharpsville, Pa., on the insertion of plates of steel, wrought iron or other metal in the teeth of gearing, as seen in Fig. 1. This is a method which internally chills and strengthens the teeth. The plates are prepared by a process which causes the iron to adhere to them firmly, and are held in place by special methods of molding. Primarily, chilling the metal immediately in contact with the inserted plates gives a tooth that has a soft face, allowing gears to work quickly to mesh. There is then found an increasing hardness from the chill caused by the plates in the teeth, and this tends to prevent further wear. Incidentally the teeth are much strengthened by this process of manufacture. This condition of internal hardness, the reverse of what is usually found in cast or cut gear teeth, is a very desirable improvement for many classes of gearing.

THE Robert Clarke Co., of Cincinnati, has just published in a book of 738 pages the fourth edition of Brewer and Laubscher's "Ohio Corporations," containing all the laws of Ohio on corporations, except municipal. The work has forms for organizing and conducting corporations of every description, with by-laws and regulations. It has all Ohio decisions relating to corporations, digested in short, clear statements, showing what the Supreme Court and other courts have said on the various questions constantly arising out of the vast business managed under corporate organizations. It has an analytical index, so arranged that any one of the five thousand topics scattered throughout the statutes can be instantly found. It not only has all the statutes, printed in new, clear type, with black-faced headings, but all provisions of the Constitution on corporations. This fourth edition, like its three predecessors, meets the demand for full information, on a subject so important that it affects nearly every citizen. The price is $4.

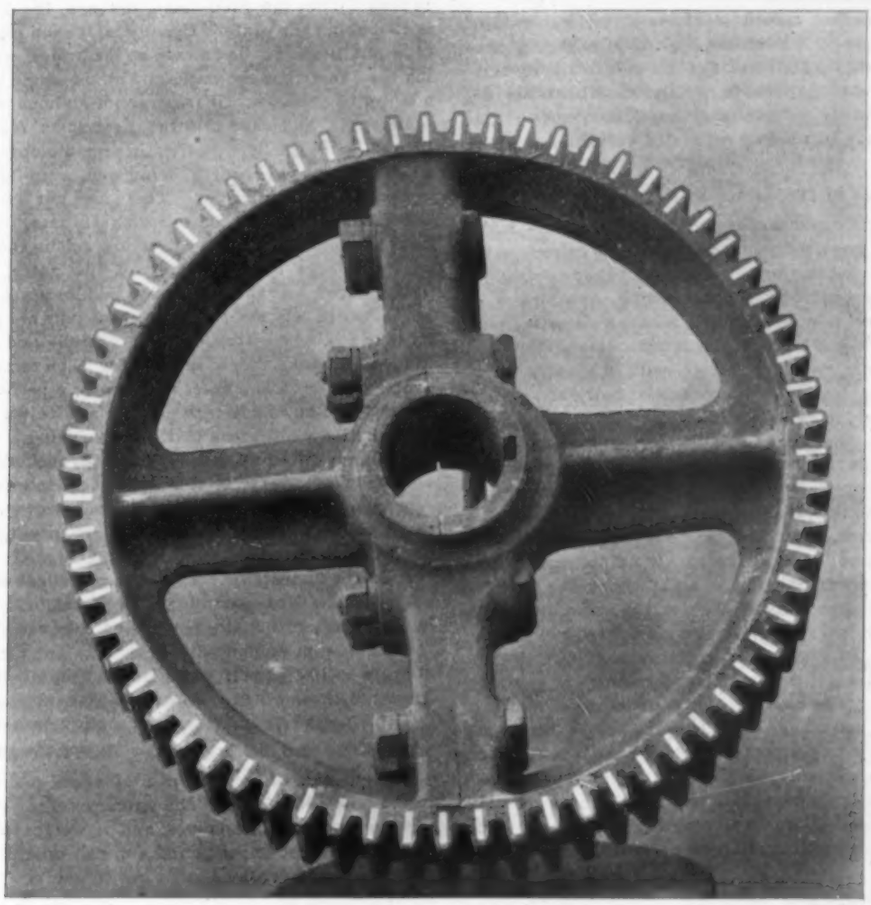


FIG. 1.

MALLEABLE CAST IRON.

The process of rendering cast iron malleable has been known for nearly two centuries; its perfection, in the present sense of the word, has been the work of the last five years. Originally dependence was placed upon the removal of as much of the carbon in the thin castings subjected to the annealing process as possible; now it has been found that substituting sand for fire clay for the oxidizing scale gives equally good results, and the main value of the process lies in the change from combined carbon to temper carbon in work which may be up to two inches thick. The remarkable extension of the malleable iron process from light harness and agricultural work to heavy railroad castings, couplers, and the like, is the result of American enterprise. We find the original description of the process by Reaumeur in 1722. It seems to have been specially developed in England, where, as well as in Germany and France, many malleable castings are still produced by the old crucible process. The contrast between 500 pounds a day, cast from crucibles in Europe, and a modern malleable iron works in this country, of 50 to 75 ton capacity, is one of the many things in the iron and steel industries that redound to the credit of the United States.

In this country the first record we have of malleable cast iron dates back to the early twenties, Seth Boyden being the pioneer, and Newark, N. J., the seat of the industry. By this time, however, the material was a widely known article of commerce on the other side of the water, and today the world's product may be roughly estimated at half a million tons per annum.

Properties of Malleable—Raw Material.

The reason for this rapid expansion is not hard to find. Malleable cast iron has a unique position in the iron industry. Softer than cast iron, it can be battered out of shape before it breaks. It surpasses steel in shock-resisting qualities, for while a piece of steel may be strained within its elastic limit many times over without harm, if the strains extend beyond this range the piece is ruined. Not so with malleable cast iron. Take two couplers with their heads battered up in service, one a malleable cast iron, the other cast steel. A test piece cut from the tail of the former will show good sound material, while the latter has been so fatigued, lines of crystallization opened, etc., that it may pull at one third of the strength it should have shown.

Malleable cast iron may be twisted, bent, machined, polished, threaded and, in fact, treated just as cast iron and cast steel without detriment. It has eight times the shock-resisting qualities of the best cast iron, and is about one-half as strong as the best cast steel. It is, therefore, used where cast steel would be too expensive, and replaces cast iron, dollar for dollar, where strength is wanted, and castings of half the weight will answer. The analysis of a piece of good malleable cast iron would be about as follows: Carbon (weighed as graphitic) 3.20 to 4.00 per cent; combined carbon, 0.10 to 0.60; manganese, about 0.25; sulphur, not over 0.07; phosphorus, not over 0.250 per cent. Its physical strength should be about as follows: Ultimate strength, 37,000 to 45,000 pounds per square inch; elongation in 2 inches, 3 to 5 per cent.

The materials used in the manufacture of malleable iron castings are pig irons running low in silicon. Charcoal irons seem to give the best results, but only because they are much cleaner and more uniform than the general run of coke iron. A heat of good coke iron, however, especially when steel scrap has been added, leaves nothing to be desired. There are used in this country today about equal proportions of coke malleable iron and warm-blast charcoal iron for malleable work. Charcoal iron goes to the account of the small companies, and some unprogressive or favorably situated large ones; the coke iron forms the staple of most of the heavy producers.

Malleable castings may be made either in the cupola or in open-hearth furnaces. Owing to the closeness of the grain, a cupola iron is difficult to anneal properly, and this class of malleable cast iron is, therefore, restricted entirely to very thin sections. Cupola iron can, however, be made very hot by the use of plenty of coke (occasionally as much as one pound coke to five pounds of iron). This enables the founder to run it into the thinnest kind of castings, such as shoe buckles, harness work, scissors, etc. Furnace iron, unless special precautions are taken, is apt to be somewhat dull at the first of the tap, and should, therefore, go into very plain work, otherwise misruns are likely to occur. On the other hand, during the melting process the oxidation of the silicon means an increase in the internal heat of the bath, hence more fluid iron, and the temptation is to cast light intricate work at the end of the heat. Unfortunately, however, burning out silicon means introducing oxygen into the bath; pin holes will appear in the surface of the castings, and if aggravated there will be a burning of the iron in the annealing process, hence the danger of casting light work at the end of the heat.

Process of Manufacture.

The difficulties attending the preparation of malleable cast iron are so great that the whole process has remained a mystery to outsiders, and consequently we find only those who have become thoroughly familiar with every phase of the process going into business on their own account.

The furnace processes are twofold; the plain hearth with or without top blast, and the regular Siemens-Martin furnace. The capacity of the hearth furnaces is usually from 6 to 12 tons. They are fired from the end, the blast being admitted under the grate. Usually a branch pipe is placed to blow additional air downward at the bridge wall, thus throwing the flame upon the bath, and at the same time promoting a better combustion. It takes about an hour to charge a 10-ton furnace, and after this the heat lasts from four to six hours. With the open-hearth furnace the operation is somewhat different; the hearth being hot, a 10-ton heat can be gotten out an hour earlier. There are but two works in the world now using the open-hearth furnace, but the indications are that many more will follow suit in the near future.

The castings, after knocking off the gates, are rolled up clean, sorted, and then packed in puddle scale in large iron boxes, called saggers or pots. These pots are introduced into large ovens, which are closed up carefully and fired up to a red heat for from four to seven days. The remarkable change in the state of carbon takes place here; a perfectly white hard casting turning to one with a rich black velvety fracture. In England they call this a black-heart casting. In this country the name is not heard now; in fact, anyone receiving a casting which is not a characteristic black in the interior would soon return it. The English name would, however, seem to indicate that other than black castings get into their market as malleable cast iron.

After the anneal, the castings, now malleableized, are rolled up again, the fins ground off, an occasional warped piece straightened, and finally shipped as they are, or first dipped into asphaltum diluted with benzine. The process as above roughly outlined has to be carried out in all cases, the labor-saving methods used in malleable works varying in accordance with the means and the degree of enlightenment available.

Cost and Selling Price—The Malleable Field.

The question of cost is one of some delicacy just now, prices being very high. The average selling price of a plain casting with few or no cores, and a weight not less than 10 pounds, is about 4c per pound for fair orders, and is shaded down to 3.25c in carload lots. As to the cost of production, no figures can be had beyond the fact that in the hard times just passed quotations were made as low as 2c, which can be taken to be just a little below cost, for the works in question found it better to lose a little on that particular job in order to hold the customer and keep the organization of the working force intact. It is a question if today the plainest malleable castings can be made for less than 2.5 to 2.75c a pound.

With intricate work prices rapidly increase. Thus, for castings to be used for scissors, harness work and the like, 12c a pound was often paid, even in the hard times. As everything at the present time runs into tonnage, this small work is no longer desirable from the foundryman's standpoint, but it must be said that some of the best products of the molder's art and that of the expert annealer are found exemplified in this class of castings. Reviewing the field covered by malleable cast iron we see the following varieties which appear on the market:

Hardware.—Hinges, locks, scissors, pistols, rakes, gas and oil stoves, vises, ice cream freezers, wash wringers, washing

machines, safes, wrenches, monkey-wrenches, awning pulleys, etc.

Agricultural Machinery.—Mowers, reapers, binders, are almost completely made up of malleable castings.

Machinery.—Crank shafts for smaller sized engines, gear wheels, connecting rods. Cutters for wood-working machinery are best made of case-hardened malleable cast iron. Sewing machines, boiler nuts, conveyor chains, etc.

Pipe Fittings.—For steam, gas, air and railings in endless variety of shapes and sizes.

Railroad Castings.—Hundreds of different castings from the car coupler and journal boxes down to lamp wick trimmers—all freight cars are now equipped with malleable castings. Track supplies, rail joints, "S" wrenches, locomotive castings, water scoops, etc.

Electrical Castings.—Wire clamps and supports, motor gears, and cases.

Harness.—Saddle, carriage and wagon castings. These are often plated with nickel, silver and gold. Horseshoes.

Besides the above standard castings, there are numberless others which are made as wanted, showing that the industry embraces a wide and varied field.

The outlook for the business in malleable iron casting is exceedingly bright, so much so that only the comparatively large capital and the unusual skill required deter the general foundry trade from rushing into it. While it is not so very difficult to make small malleable castings which will pass muster before the general public it takes a long experience and bright men to make heavy work acceptable to the great railroad interests. The capital required is a serious question. An ordinary jobbing foundry can be started for about $10 000. No one, however, could think of erecting even the most modest malleable works with less than $40 000. If successful with this amount, the capitalization is soon doubled, but if only the ordinary amount of intelligence is available, the works will quietly drag on year after year catering to the special lines that called them into existence. Witness some 60 plants of this kind in the United States alone. The more progressive works soon make a reputation for themselves, and many are household names, so to speak, among prominent consumers of malleable castings.

Output of Malleable Plants.

It is almost impossible to obtain any information regarding the output of a malleable iron plant. Only an intimate touch with the business, coupled with an intelligence department, consisting of tramp molders, whose reports must be carefully sifted to get down to the actual facts, will accomplish this. The figures given below are intended to present a general idea of the condition of the trade as shown by the larger well-known works. The individual output of each concern as given may be appoximate only, for it is not usually possible to get a man who manufactures malleable cast iron to tell anything about his business, or to get into his works if one is known to be connected with the iron industry. The figures are, however, very close, and may be relied upon as representing the average tonnage of castings shipped daily. Practically all the works were in existence 10 years ago, and many have only been enlarged quite recently. The hard times of the past few years were exceptionally severe on the malleable iron business; many a surplus was wiped out, works were shut down and prices were cut so low that profits were out of the question. The new works now being built will take care of the legitimate growth of the business for the next decade and there will be no room for new ventures until that period of time has elapsed. The most notable enterprise in this connection is the Pennsylvania Malleable Co., of Pittsburg, Pa., with works at a suburb called McKees Rocks. With a capital of $600 000, a modern foundry on advanced lines for malleable castings has been erected. The output provided for is 100 tons a day, or 25 per cent greater than the largest single works in existence. There are no less than eight other works in course of erection, the output ranging from 5 to 35 tons a day each.

The following list embraces the principal works in the United States, and states their special line of product and daily output:

Connecticut.—Malleable Iron Fittings Co., Brantford, 15 tons; specialty, pipe fittings. Naugatuck Malleable Iron Co., Naugatuck, 20 tons; custom work. Bridgeport Malleable Iron Co., Bridgeport, 30 tons; custom work. The last two works, with the Vulcan Malleable Co., of New Britain, 12 tons, belong to the circuit of the National Malleable Castings Co., headquarters in Cleveland, O. Other works in Connecticut bring the total output per day of malleable castings in the state up to 100 tons.

Delaware.—Wilmington Malleable Iron Co., Wilmington, 15 tons; custom work.

Illinois.—Chicago Maleable Iron Works, a branch of the National Malleable Castings Co., 50 tons; custom work. Missouri Malleable Iron Works, East St. Louis, 50 tons; couplers and custom work. Crane Co., Chicago, specialty, fittings; 15 tons. Union Malleable Iron Co., Moline, custom work; 15 tons. The state has a total output of 275 tons a day.

Indiana.—Indianapolis Malleable Iron Works, a branch of the National Malleable Castings Co., custom work, couplers, etc.; 60 tons. Whiteley Malleable Castings Co., Muncie, make miscellaneous couplers and custom work; 50 tons.

Maryland.—Baltimore Iron & Steel Castings Co., 10 tons; custom work.

Massachusetts produces 9 tons daily.

Michigan.—Michigan Malleable Iron Co., Detroit, agricultural and other light work; 50 tons. Standard Malleable Iron Co., Muskegon, oil stoves and custom work; 15 tons.

Minnesota.—Interstate Malleable Iron Co., Duluth, 15 tons; railroad work. The state produces 37 tons daily.

Missouri.—Missouri Car & Foundry Co., St. Louis, railroad castings; 25 tons.

New Hampshire produces 6 tons daily.

New Jersey produces 15 tons daily.

New York.—Pratt & Letchworth, Buffalo, custom work, malleable castings; 20 tons. Gould Coupler Co., Depew, specialty, couplers; 60 tons. Isaac G. Johnson & Co., Spuyten Duyvil, 10 tons; custom work. Troy Malleable Co., branch of the National Malleable Castings Co., custom work; 25 tons. The state produces daily 225 tons of malleable castings.

Ohio.—Buckeye Malleable Iron and Coupler Co., Columbus, specialty, couplers; 60 tons. Dayton Malleable Iron Co., railroad castings, 40 tons. Springfield Malleable Iron Co., railroad castings; 40 tons. National Malleable Castings Co., Cleveland, couplers and custom work; 75 tons. National Malleable Castings Co., Toledo, custom work, 50 tons. Eberhard Mfg. Co., a branch of the National Malleable Castings Co., also of Cleveland; specialty, harness work; 25 tons. The state produces 355 tons daily.

Pennsylvania.—Stanley G. Flagg & Co., Philadelphia and Pottstown; specialty, pipe fittings; 20 tons. Erie Malleable Iron Works, Erie; custom work; 50 tons. The McConway & Torley Co., Pittsburg; specialty, couplers; 75 tons. Pittsburg Malleable Co., specialty, airbrake castings; 25 tons. Jarecki Mfg. Co., specialty, pipe fittings; 10 tons. The state produces 220 tons of malleable castings daily.

The South is represented by the Southern Malleable Iron Works, Chattanooga, Tenn., 15 tons; custom work.

Wisconsin.—Wisconsin Malleable Iron Co., Milwaukee, custom work; 40 tons. Northwestern Malleable Iron Co., Milwaukee, custom work; 40 tons. The state produces 130 tons daily.

Several other states have small amounts, the sum total for the United States amounting to a daily output of 1,688 tons of castings. This would indicate that we produce about 500,000 tons of malleable castings a year. There is little wonder, therefore, that the malleable castings industry is attracting world-wide attention at the present time.

Germany has about 35 malleable cast iron plants; France about half as many. England can boast of the oldest one in existence, at Derby. Russia has one probably in operation now. Austria-Hungary is beginning to investigate the merits of malleable cast iron seriously with a view of replacing the gray-iron railroad castings. We can safely estimate the combined production of malleable castings in the old world at 75,000 tons a year, a sharp contrast with the figures for our own country.

The new development the coming times will bring us remains to be seen; there is no lack of talent aiming at an all-around improvement in the art of making malleable iron castings. When the next period of commercial depression occurs we will be in better position to value the state of the art. The rush of business today precludes any serious experimental work in the line of specific adaptation of the product for special lines of work.—[Engineering and Mining Journal.

CHICAGO PNEUMATIC RAMMER.

The Chicago sand rammer recently placed upon the market by the Chicago Pneumatic Tool Co., of Chicago, is an added appliance of this company for utilizing compressed air. It is simply an adaptation of the principle of some of its other pneumatic tools to this purpose. The rammer is made in varying sizes, but the standard size is known as No. 4, being the one best adapted to the general requirements of the trade. Its weight, with counter-balance, as shown in the illustration, is 290 pounds, of which 130 pounds is the weight of the counter-balance. When operated under an air pressure of 40 pounds to the square inch, which is found to give the best results, the rammer strikes about 300 blows per minute. The maximum stroke is 7 inches, but the valve motion is such as to make it a variable stroke machine, that is, the further down the cylinder is pressed when the machine is in operation, the shorter the stroke becomes, with a consequent increase in the number of blows per minute, and the further away the cylinder is held from the work, but within the maximum stroke of the piston, the longer the stroke is, with a consequent less number of blows per minute, but more forcible ones.

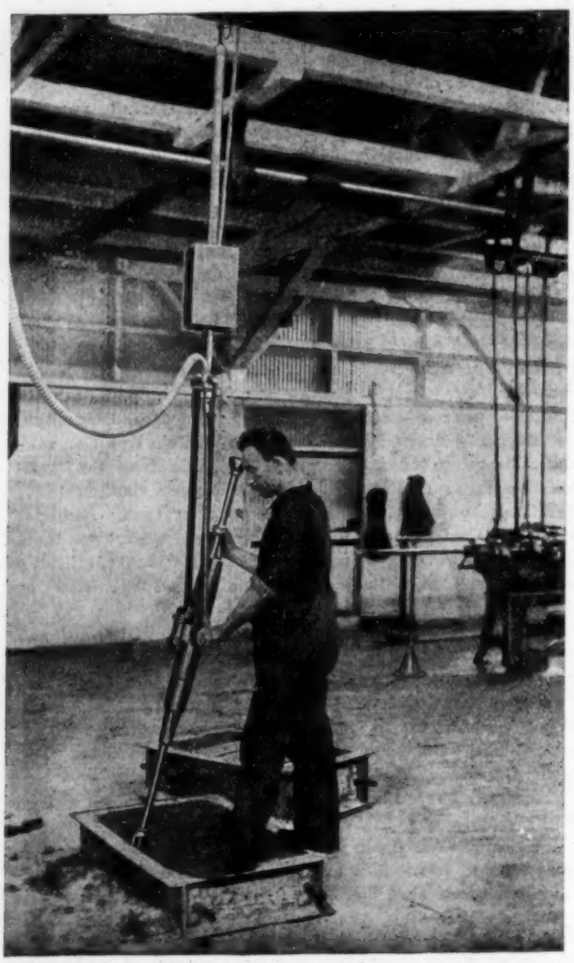


FIG. 1.—PEIN END RAMMING AT SIDE OF BOX.

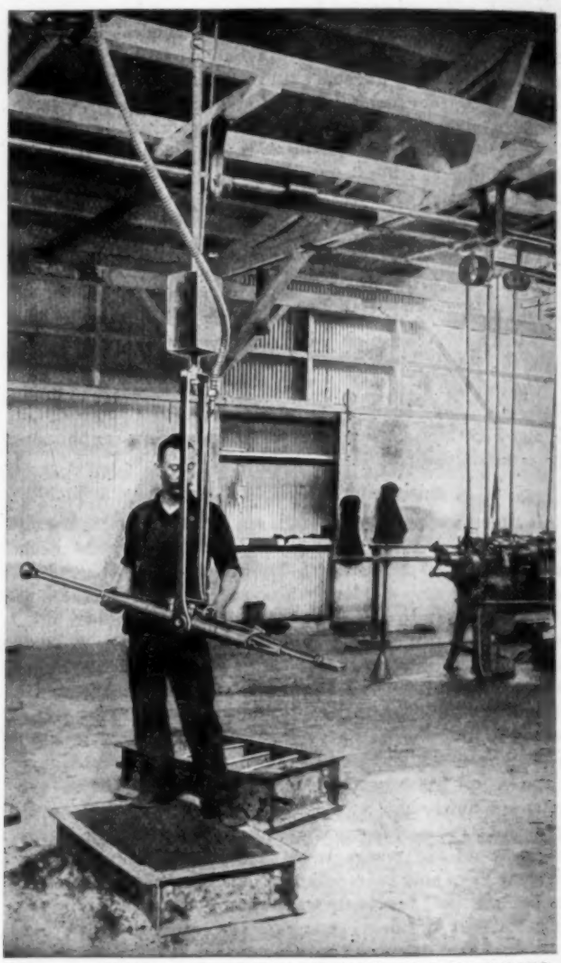


FIG. 2.—RAMMER IN HORIZONTAL POSITION, SHOWING METHOD OF REVERSING ENDS.

These results are accomplished by the employment of an auxiliary valve. This times the movements of the main valve so that the piston will complete its full stroke before the main valve reverses to admit the fluid into the cylinder for the return stroke of the piston. The auxiliary valve is controlled by the piston by means of ports so located in the cylinder that the valve will be operated when the piston is at its shortest stroke, which is in the middle of the cylinder, where a groove in the piston will reciprocate across grooves in the cylinder on any desired stroke, from scarcely more than a vibration of the piston to a full stroke. After the groove in the piston crosses the lower groove in the cylinder, an interval of time is required for the piston to complete its full stroke. The auxiliary valve is so regulated as to occupy the same length of time in completing its stroke in order to reverse the main valve, which moves very quickly, and immediately after the blow is struck on the drill bit, admitting the fluid for the return stroke of the piston. In the return stroke the auxiliary valve is regulated to throw the main valve in time to admit the fluid into the top end of the cylinder to cushion or check the piston from striking the top cylinder head. The machine works under the pressure stated without vibration, and is easily handled. The air consumption when operated under a pressure of from 40 to 50 pounds per square inch is 20 cubic feet of free air per minute.

It is estimated that more sand can be rammed in a given time and in a better manner by this machine than can be done by five men doing hand work. The rammer is suspended from the ceiling in the ordinary manner and requires but little room for its operation. This rammer is now successfully used in several leading steel foundries, and will be installed in other places as soon as shipment of the rammers already ordered can be made. The butt and pein ends are attached to the opposite ends of the piston, which extends through the cylinder of the machine. To change ends it is only necessary to revolve the rammer on its axis, as will be seen by referring to the illustration.

In addition to the saving of time referred to, the advantage of this rammer lies in the fact that the operator is not required to exert any power beyond guiding the machine and varying the blow, rendering his task far less irksome and laborious than with the old method of hand ramming.

THE Philadelphia & Reading Railway has placed an order with the Baldwin Locomotive Works, at Philadelphia, for 45 locomotives.

THE Burgess Iron & Steel Works, at Portsmouth, O., will be shut down for repairs shortly.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market, and Some of Their Wants:

F. C. Robbins, T. E. Thomas, W. H. Smiley, Wade A. Taylor and William Herbert, incorporators of the Independent Iron & Steel Co., of Niles, O., have signed a contract with the Niles board of trade to either erect a six-mill sheet iron plant at Niles or purchase the forge and plate departments of the American Sheet Steel Co.'s plant at Niles.

A. N. Jones and D. N. Baxter have organized a company at Wichita, Kan., to manufacture Baxter's improved boiler tube cleaner.

The Forsyth Mfg. Co., of Buffalo, N. Y., has been incorporated at $50,000, to manufacture metal goods and bicycle sundries. The incorporators are: C. E. Forsyth, H. B. Rose and E. A. Forsyth, Jr., all of Buffalo.

The Tangent Grip Pulley Co., of Jamestown, N. Y., has been incorporated with $20,000 capital, to deal in power appliances and mechanical goods. Directors: F. W. Gurney, T. W. Addenbrook, and J. R. Sage.

The Banting Machine & Supply Co., of Toledo, O., organized to deal in boilers, engines, threshing machinery, etc., has been incorporated with capital of $50,000 by J. W. Keating, C. C. Banting, P. W. Feilbach, J. Banting and F. E. Moulton.

A Virginia charter was granted the Thomas Iron Works, of Berkley, Va., last week. Capital $25,000. The company will repair steamships and vessels and boilers, engines and machinery. Herbert Roberts is president; Cornelius Thomas, vice-president; R. E. Crump, secretary and treasurer.

It is reported that Chicago capitalists are considering the location of a tin plate mill at Benton Harbor, Mich.

The Provident Furnace Co. was incorporated at Dover, Del., with a capital of $200,000, to manufacture and deal in furnaces. The incorporators are: J. Murphy, J. H. Topping, J. N. Yeomans, J. F. Carmichael, and R. Skene, all of Chicago, Ill.

R. A. Wilson & Co., of Shousetown, Pa., will open a brass foundry.

The Clark Cast Steel Cement Co., of Huntington, Conn., has been organized with a capital of $2 000.

The Foundry Supply Co., with a capital of $1,500 000, was incorporated at Camden, N. J., last week.

Phillip Walters, H. P. Walters and W. C. Hering, of Fostoria, O., have secured a lease on a portion of the plant formerly operated by the Fostoria Brass & Iron Works for the purpose of operating what will be known as the Fostoria Foundry & Machine Co.

The Thomas Iron Works Co., Berkley, Va., has been incorporated, with Herbert Roberts, president, Cornelius Thomas, vice-president; R. E. Crump secretary and treasurer, to build and repair steamships and vessels, engines, boilers, and other machinery; capital stock, $25,000.

E. A. Poe, Fayetteville, N. C., is in the market for 50 h. p. boiler, new or second-hand; engine also may be wanted.

The Southern Trunk Co., Knoxville, Tenn., wants 30 to 40 h. p. automatic engine and 50 to 60 h. p. boiler, with pump and heater; second-hand preferred.

The Birmingham Rail & Locomotive Co., Birmingham, Ala., wants two 15-ton capacity broad-base hydraulic jacks, with 12-inch lift, not over 26 inches high.

The New Brighton Steel Co., New Brighton, Pa., has been incorporated at $15,000 to manufacture tool steel. The directors are: J. J. Blake, P. H. Reehl, Furness Walker, Wm. K. Gordon, Clarence Rarick, C. A. Dombacher, and C. C. Rouser. The company is composed mainly of former employes of the Beaver Falls Steel Works, which was bought recently by consolidated interests. The furnace is being erected.

J. B. Jones & Co., Allegheny, Pa., are in the market for extra heavy alligator scrap shear and a cold-saw for cutting heavy shafting, beams, etc.

The Akron Engineering Co., Akron, O., has been incorporated in West Virginia, with a capital stock of $100 000. Incorporators are: H. C. Spicer, C. A. Stowers, R. E. Nevin, George C. Kohler, and Harvey Musser. Five acres of land have been purchased along the Erie railroad. A foundry, 50x75 feet, and a two-story machine shop, 35x60 feet, will be erected, which, with equipment, will cost $25,000. The plant will be ready about March 1, 1901.

The Pittsburg District:—

The New Brighton Steel Co., of New Brighton, Pa., has been granted a Pennsylvania charter with a capital of $15,000. The incorporators are: J. J. Blake, P. H. Reehl, F. Walker, W. K. Gordon, C. Rarick, C. A. Dombachery and C. C. Rouser.

The American Bridge Co. will immediately commence the erection of a railroad bridge over the Ohio river at Neville Island, for the Pittsburg & Lake Erie railroad company. The contract was awarded several months ago.

The invoice department of the American Steel Hoop Co. has been removed from Pittsburg to the Battery Park Building, New York. There are now in Pittsburg the purchasing, district sales and operating departments.

The Carroll-Porter Boiler & Tank Co., which accepted the proposition to erect a plant at Wellsville, O., for a free site of six acres and a $15,000 bonus, will immediately erect a main building, 400 feet in length and 80 feet wide. It will have a wing 45x90 feet.

The Pittsburg Coal Co. has contracted with Wm. B. Scaife & Sons, Pittsburg, for a number of new mine buildings of steel frame construction; also for a steel frame bridge and trestle to be erected at Bridgeville, Pa.

The Allegheny Steel & Iron Co. will erect a steel plant at Brackenridge, Pa. The contract for the buildings has been let to the American Bridge Co. This includes two producer sheds, a boiler house, a main building, an open-hearth building, and a crane run-way. The main building will be 72x252 feet, with four lean-tos. The open-hearth building will be 72x161 feet, with three lean-tos. About 500 tons of steel will be required.

James McKay & Co., Pittsburg, have purchased 10 acres of land at McKees Rocks, for $40,000, and will remove their plant thither. The company has been cramped for space, and the capacity of the new plant will be increased. Plans are ready and the contract for construction of the new plant will soon be let.

The Edgar Thomson plant of the Carnegie Steel Co resumed operations Wednesday of this week after being shut down for about three weeks, during which time extensive repairs and improvements were made. The method of hardening rails by leaving them a greater length of time on the cooling beds before giving them the final pass will be watched with much interest by both steel and railroad interests.

The first coupon on the $40 000,000 series D 5 per cent bonds of the Carnegie Co. was due and payable Saturday, Dec. 1. This coupon is for eight months' interest and the total disbursement on this account calls for about $1,332 000. During the past week the bonds sold at 105 and accrued interest, and there were very few offerings at this quotation.

The Pittsburg Casting & Machine Co., of Allegheny, Pa., will erect an addition to its present plant, 60x150 feet. The company has been fairly swamped with orders during the past month and the enlargement is made necessary to take care of the work.

The Pittsburg Steel Construction Co, of Pittsburg, Pa., has received a contract for the construction of a paper mill at Norwood, N Y., for the Remington-Martin Co. The building will be steel throughout and will require approximately 1,000 tons of structural material.

New Construction:—

The Buda Foundry & Mfg. Co., of Harvey, Ill., will erect an addition 100x200 feet in size.

The Globe Machinery & Supply Co., of Des Moines, Ia., will erect a large warehouse.

The Columbus, Sandusky & Hocking railroad will build a 50x50 foot addition to its machine shop at Columbus, O.

The Norton Iron Co., of Ashland, Ky., has commenced the erection of a wire galvanizing plant.

Pattin Bros. & Co. Marietta, O., will erect a 50x60 foot addition to their machine shop. It will also contain a forge shop.

The Pencoyd Iron Works, of Pencoyd, Pa., will erect a foundry and machine shop, each 100x340 feet, on the Wissa-

hickon river. The foundations for the buildings are already being laid.

The Lizzie Lowman Foundry Co., at Sheffield, Ala., will shortly add to the casting floor of its foundry.

William Bayley & Sons Co., Milwaukee, Wis., whose machine shop was recently destroyed by fire, are preparing to erect a new building in the shape of an "L," one section of which will be 50x120 and the other 70x190.

The Chattanooga Furnace Co., of Chattanooga, Tenn., will make extensive improvements, involving the expenditure of about $50,000 at its furnace. The old stoves will be replaced by an entirely modern equipment.

On a plot of ground between the Midland and Dedham branches of its road, the New York, New Haven & Hartford railroad will erect at Readville, Mass., a large rolling stock plant which will contain 17 buildings.

The Standard Tool Co., of Cleveland, O., will commence the erection of a large office building in connection with its present plant.

The Bradford (Pa.) Steel Co., recently incorporated, has let contracts for the erection of buildings. The main building will be 60x100 feet and there will be two side buildings, 25x40 feet each.

The Reading Iron Works, Reading, Pa., is erecting an addition 70x80 feet, to its tube mill.

The new building of the Northwestern Steam Boiler Works at Duluth Minn., is nearly completed. It is 196x80 feet.

The Globe Iron Co., Johnstown, Pa., will add a machine shop to its plant. The building will be of heavy frame, and about 25x40 feet in size. A contract has been given to the Whiting Foundry Equipment Co., Harvey, Ill., for a 4-ton ladle and a hoist. The company is in the market for a 42-inch lathe, 22-inch lathe, large drill press, and a medium sized planer, all second-hand.

The Buckeye Engine Co. Salem, O., will erect a new foundry 203x80 feet. The contract for structural iron work has been let to the Fort Pitt Bridge Works, Pittsburg Work on the foundations will be started as soon as the new 100-ton track scales, now under way, are ready for use, which will be in a few days. The new building will be located close to the present foundry, so that when completed the two may be thrown together. Its equipment will consist of two traveling cranes of 15 and 25 tons capacity, in addition to all the modern appliances for handling large castings with the least possible expense. Since election the company has taken orders for engines aggregating $50 000 Of these engines four are to be designed for the Malleable Iron Works at Muscatine, Iowa, three for an Indianapolis firm, five for the Diamond Match Co., three for Biddeford, Maine; two for Government dry docks at Boston, and one for a Beaver Falls, Pa., concern. Orders have also been received for engines for Manila, P. I. and Valparaiso, Chili.

The Wright & Colton Wire Cloth Co., Worcester, Mass., will build a one-story brick and iron addition 35x80 feet.

It is reported that a stove foundry and architectural iron works will be built at Dalton, Ga.

Chicago District and Northwest:—

Montgomery Ward & Co., of Chicago, have closed a contract with the Chicago Heights Land Association for a tract of 15 acres at Chicago Heights as a location for buggy and farm wagon and other factory plants and the erection of a storage and distributing warehouse, with railroad belt line connections. Plans are made for a main factory building, 60x400 feet, and power house. The improvements, it is estimated, will cost $250 000.

The Chicago Heights Land Association has a warehouse project for placing under roof nearly 700 acres. According to present plans, two of the warehouses will be one story high, and one will be six stories. They will be 700 feet wide and 5,200 feet in length. The railroad yards alone will have a capacity of 5,000 cars, which can be added to from time to time as the business may warrant. These mammoth warehouses and freight sheds will be equipped with every facility for handling and distributing freight.

Twenty-five operators of molding machines employed by the Latrobe Steel & Coupler Co., at Melrose Park, Ill., went on a strike recently owing to a reduction in their wages.

The Gates Iron Works, Chicago, has received an order for 10 000 special stamp shoes from the Homestake Mining Co., of Lead, S Dak. This order will require 51 freight cars for its transportation, and is unique in that it is probably the largest order for stamp shoes ever placed by one company. The Gates Iron Works has been very successful in producing stamp shoes combining great strength and hardness, and secured the trade of the Homestake mine under severe competition from other manufacturers.

Plans are being prepared for the new plant of the Nordberg Mfg. Co., of Milwaukee, Wis., whose project for a greatly increased plant was mentioned in this column lately.

The Modern Tool Co. has been incorporated at Indianapolis, Ind., with a capital stock of $40,000, by B. Wallace, Fank L. Gallagher and G E. Shafer.

The Maywood Foundry & Machine Co., Chicago, has secured the contract for the complete equipment of the new foundry of the Acme Harvester Co., near Peoria, Ill., with molding machines. The Maywood company has been having a very good trade, and reports excellent prospects for the future.

Schwab & Sercomb, Milwaukee, Wis., founders and manufacturers of heating apparatus, are planning to erect a new plant in the spring, the main building of which will be 100x200 feet in size. The present force of the concern, about 250 men, would be doubled.

The Continental Chain Co. has been incorporated at Chicago, with a capital stock of $35 000, to manufacture chain, iron and steel specialties and hardware. The incorporators are J. E. Hubbert, A. S. Furber and Max Guthman.

General Industrial Notes:—

The Lackawanna Iron & Steel Co. has awarded the contract for the erection of its intake and the laying of its conduits for its West Seneca, N. Y., plant to Grattan & Jennings.

The Taughannock Emery Wheel Co., of Cortland, N. Y., has rented a portion of the Keator-Wells foundry at Cortland, and has already removed its plant to the larger quarters.

The Chamber of Commerce of Toledo O., is offering inducements to the Ideal Foundry Co., of Miles Grove, Pa., manufacturers of gray iron castings, to remove the plant to Toledo.

Repairs on Furnace B. of the Tonawanda Iron & Steel Co., at Tonawanda, N. Y., have been completed and the furnace is again in blast.

An order was issued last week by the Supreme Court of the State of New York for the final closing of the affairs of the Niagara Car Wheel Co., of Niagara, N. Y., returnable Feb. 20, 1901. The capital stock of the company is $110 000 and about $100 000 has been realized on the assets. After paying creditors, about $20 000 will be divided among stockholders.

The Attalla Iron Ore Co., of Chattanooga, Tenn., has commenced suit against the Virginia Iron, Coal and Coke Co., for $40,000 alleged to be due on an ore contract. The bill sets out that the Virginia company contracted in October, 1899, to purchase from the Attalla Iron Ore Co. 100,000 tons of ore at $1.25 per ton delivered on cars at Attalla, Ala. Only 20,000 tons were delivered on the contract and meantime the price of ore dropped to 75 cents a ton. The plaintiff seeks to recover 50 cents per ton on 80,000 tons of ore.

The charcoal furnace of the Jenifer Furnace Co., Jenifer, Ala., will be put into blast about the first of the year. The company has recently received a number of contracts for pig iron for delivey in the first half of next year.

The mayor of Detroit, Mich., has received a letter from the Bradley Stencil Machine Co., of St. Louis, Mo., asking what inducements would be offered to locate their plant at Detroit.

The Rarig Engineering Co., of Columbus, O., is building a large Corliss engine for shipment to Alabama.

The Judson Rolling mills at Oakland, Cal., have been shut down temporarily for repairs.

Preparations are already being made for the removal of the Asbestos Sad Iron Co.'s plant at Stoughton, Wis., to Canal Dover, O., where a new company has been organized with increased capital.

New locomotive and car building noted in the Nov. 30 issue of the *Railway Gazette*: The Schenectady Locomotive Works have an order for 20 locomotives for the Chicago & Northwestern, and the Richmond Locomotive & Machine Works, 5 locomotives for the Rio Grande Western. The

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Lake Shore & Michigan Southern is reported to be in the market for 100 locomotives and the Northern Pacific for 50 to 75 locomotives. The Wabash has been figuring on buying 50 locomotives. The American Car & Foundry Co. will build 300 refrigerator cars for the Illinois Central, 100 box cars for the Rio Grande Western, and 50 narrow gauge gondola cars for the Florence & Cripple Creek. The Northern Pacific is asking prices on 40 to 50 passenger cars, and is reported to be in the market for 3 000 to 5 000 freight cars.

A notice was posted at the Pennsylvania Steel Works, Steelton, Pa., Nov. 30, announcing a reduction of 10 per cent in wages, to take effect Jan. 1. The reduction affects 6,100 men. In the last four years there have been two 10 per cent advances.

Plans are under consideration for the erection of a tin plate plant in Harrisburg, Pa. Enoch Stanford, late general manager of the Lalance-Grosjean Mfg. Co.'s tin mills in Harrisburg is interested.

R. A. Wilson & Co., Shoustown, Pa., have leased the plant recently vacated by the Sharon Boiler Co., Sharon, Pa., and will open a brass foundry, to be used until a larger plant can be built. The Sharon Steel Co. has contracted for a large share of the output.

The Manchurian Railroad Co. has contracted with Ingersoll Sergeant Drill Co., of New York City, for machinery and tools for use in boring a tunnel a mile and a half long at Charbin, Manchuria. The contract price is $600,000.

Samuel Smith & Son, Paterson, N. J., have installed a 20-ton, five motor "Northern" electric traveling crane, manufactured by the Northern Engineering Works, Detroit, Mich. This crane is of a special type designed especially for boiler shop service.

The Thibodaux Boiler Works and the Thibodaux Sheet Metal Works, of Thibodaux, Iowa, have consolidated and formed the Thibodaux Boiler Works, Ltd. O. Naquin is president of the new company; L. Breaud, vice-president, and J. Breaud, general manager.

The Wm. H. Trigg Co., Richmond, Va., will occupy its new shipbuilding yard about Jan. 1. They cover about 26 acres, with 1¼ miles water frontage. Electric power will be used. The contracts for new machinery and other equipment have been let.

The new plant of the Seaboard Steel Castings Co., Chester, Pa., is nearing completion. The two 20-ton open hearth furnaces are about finished, and it is expected that the first heat will be run about Dec. 10. Nearly all the machinery is in place, and there remains little but the minor details for completion.

Ella furnace, at Sharpsville, Pa., owned by Pickands, Mather & Co., of Cleveland, has been put in blast after an idleness of some months.

The plant of the American Tin Plate Co., at Ellwood City, Pa., has been closed down for an indefinite period, and the employes notified to look for positions elsewhere.

The Superior Drill Co., of Springfield, O., recently shipped to Norman & Co., Adelaide, South Australia, 800 grain drills.

No 3 blast furnace of the E. & G. Brooke Iron Co., at Birdsboro, Pa., was blown in last week after an idleness of three months.

The plate mill operated by the Pine Iron Works, near Pottstown, Pa., resumed operations last week after being shut down for four months.

The Vulcan Iron Works, of Wilkesbarre, Pa., granted the laborers in their employ a voluntary increase of 10 per cent.

The Foos Mfg. Co., of Springfield, O., is making large shipments of feed mills and forges for Germany, Norway and Russia.

The Heckert-Baltzey Billet Co.'s plant at Findlay, O., resumed operations this week after a shutdown of several months.

The work of repairing and rebuilding the plant of the Detroit Bridge & Iron Works, at Detroit, Mich., is being rapidly carried on and it is the intention to resume operations within a week or ten days.

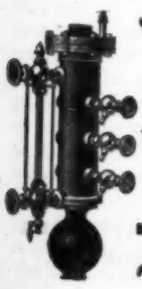
The Lady Ensley and Hattie Ensley furnaces of the Sloss-Sheffield Steel & Iron Co., at Sheffield, Ala., will probably be blown in shortly after the first of the year.

The plant of the Rogers Locomotive Co., at Paterson, N. J., closed down indefinitely on Friday, Nov. 30. On Dec. 27 a meeting of the directors of the company will be held for the purpose of voting upon a proposition relative to an immediate dissolution of the company and the winding up of its affairs.

A notice has been posted at the plant of the Pennsylvania Steel Co.'s plant at Steelton, Pa., announcing a reduction in wages of 10 per cent to take effect the first of the year.

The North Cornwall furnace of the Lackawanna Iron & Steel Co., of Scranton, Pa., resumed operations this week. The two Bird Coleman furnaces and the two at Colebrook are in need of repairs, but will be put into blast within a few weeks.

The Hess Machine Co., of Philadelphia, recently shipped to Yokohama, Japan, a complete plant of file making machin-



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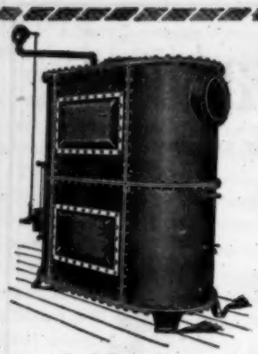

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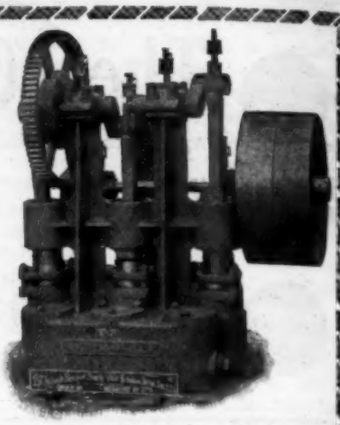

Triplex Boiler Feed Pump.

ery, having a capacity of 125 to 150 dozens files per day. This consignment was for the Japanese government.

The Lebanon Rolling Mill Co., of Lebanon, Pa., has purchased the Lickdale steel plant at Lickdale, Pa., and will remove the machinery in the plant to Lebanon, where a new mill will be erected. The Lickdale plant has been idle many years.

After being shut down eight months the south rolling mill plant of the Republic Iron & Steel Co., at Terre Haute, Ind., resumed operations this week.

The plant of the Bellefonte Iron & Nail Co., Bellefonte, Pa., erected in 1878 at a cost of $185,000, was sold last week to junk dealers for $6,375.

At a meeting of the stockholders of the Youngstown Iron, Sheet & Tube Co., held Wednesday, Nov. 28, at Youngstown, O., the following directors were elected: H. H. Stambaugh, Myron C. Wick, George L. Fordyce, Robert Bentley, H. M. Garlick, George D. Wick, William Wilkoff and James A. Campbell. The directors elected the following officers: President and treasurer, Col. G. D. Wick, late vice-president of the Republic Iron & Steel Co.; vice-president and general manager, James A. Campbell, late district manager of the Republic Iron & Steel Co.; secretary, Robert Bentley, treasurer and manager of the Ohio Iron & Steel Co; auditor, W. C. Reilly, late assistant district manager of the Republic Iron & Steel Co. Steps were taken for an immediate increase of the capital stock to $1,000,000, with a further increase to $2,000 000 in view, which is ready to be subscribed directly the stock is put upon the market. S. V. Huber, of Pittsburg, will prepare the plans for the plant.

The Roanoke Furnace Co., Roanoke, Va., has purchased the furnace of the Crozer Iron Co. for $500,000 and will blow in about Dec. 1.

The Mahoning Foundry & Machine Co., of Youngstown, O., has purchased a site of five acres upon which a plant will be erected for the manufacture of rolling mill and blast furnace machinery and equipment. It is stated that the capital stock of the company will be greatly increased.

The Bell Steam Engine Works, Buffalo, N. Y., has installed a number of new tools in its machinery plant. The company is very busy. It has several large marine contracts in its immediate vicinity, and has submitted figures for other marine work, principally on the Pacific coast. Recent orders for the company's Bell steam hammers include two to the National Railway Spring Co., Oswego, N. Y., and one each to Boston, Detroit, California and Georgia. It is now about to ship a No. 2 special steam hammer for use in splitting wood for chemical work.

The Canton Mine Door Co., Canton, O., has added a new boiler. Several thousand dollars' worth of machinery from Cleveland and other points will soon be installed.

The steel plant at Danville, Pa., is being dismantled, and its equipment is being transferred to the Clergue interests at Sault Ste. Marie, Ont. The new plant will include blast furnaces, smelting works, and a steel rail mill. Two of the buildings will be 600 feet in length, and another 1,000 feet, in addition to which there will be a number of smaller buildings.

THE second number of Doubleday, Page & Co.'s new magazine, *The World's Work*, with its handsome cover and excellent half-tones, measures up to the high standard set at the start. The magazine aims to reflect the spirit of contemporaneous events and thought the world over. The December issue contains an article on the "Betterment of Working Life," by R. E. Phillips, which shows what has been done toward bettering the condition of many shops and factories, enabling the employe to work more advantageously both for himself and for his employer. The magazine also contains short articles under "Among the World's Workers," on

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In generalising upon the subject of the relative claims of steam and gas engines for industrial purposes, the champions of each type of motor are sometimes content to center the issue upon the question of their thermodynamic efficiency alone. It is, in fact, the only common ground upon which they can meet, for the prices of fuel, upon which the commercial efficiency depends, are inseparable from purely local conditions. It is true that the fuel used in both forms of engine is the same (with the important exception of natural gas now used in gas engines), and that though we are accustomed to the name "gas engine," used in contradistinction to other forms of heat engine, it is none the less a coal-consuming machine, which shares with all thermodynamic contrivances the usual wasteful features.

In making comparisons of this kind, we must, therefore, take a unit of weight of coal or fuel, and ascertain how much of the thermal energy of this fuel is actually delivered in the form of mechanical energy at the shaft of the motor as measured by a brake applied at that point. By so doing w embrace all possible losses occurring during the transformation from one form of energy to another, and. however interesting it may be to be able to assign certain fractions of the total loss to special parts of the transforming apparatus, it is quite irrelevant to our purpose, for when the commercial economy of the plant, as a whole, is under consideration, we are concerned only with the total loss of energy in the system.

The gas engine is generally placed at a disadvantage unless the foregoing considerations are regarded. It is quite customary to state the performance of a steam plant in so many pounds of coal per horse power per hour. We often hear of gas engine power being expressed in cubic feet of gas, which would be valuable if the calorific value of the gas were always known. It would be equally indefinite to express the work of a steam engine in so many horse-power per cubic feet of steam without stating the pressure in pounds per square inch, and the percentage of moisture in the steam. Even if the work of both forms of motor were expressed in so many horse-power per pound of coal, it would not neces-

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NOW $1.00.

A large and growing circulation among machine shop and foundry firms has
THE IRON TRADE REVIEW

Ore and Coal Handling Machinery
For Blast Furnaces, Docks and Mines,
MINING MACHINERY,
HIGH GRADE HOISTING ENGINES.
WEBSTER, CAMP & LANE MACHINE CO., Akron, Ohio.

Monongahela Building, EDWARD E. ERIKSON, PITTSBURG, PA.
Regenerative Gas Furnaces and Water Seal Gas Producers.
Producer Gas under Tubular Boilers, saving 20 per cent in fuel. NO SMOKE.

FIRE BRICK.
BRANDS: O. K. CROWN. O. K. A.
SUITABLE FOR Furnace, Malleable, Mill, Foundry and Lime Kiln Work.
OAK HILL FIRE BRICK AND COAL CO.,
OAK HILL, OHIO.

PHOENIX HORSE SHOES—ARE THE BEST HORSE SHOES MADE
CATALOGUE SENT ON REQUEST.
PHOENIX HORSE SHOE CO., POUGHKEEPSIE, N. Y.—JOLIET, ILL.

The Champion Rivet Co.,
CLEVELAND, O., U. S. A.

Victor Boiler and Structural Rivets
FINISH UNEXCELLED. QUALITY HIGHEST STANDARD.
GOVERNMENT WORK A SPECIALTY.

KENTUCKY FIRE BRICK WORKS.
CUPOLA BRICK.
KENTUCKY FIRE BRICK WORKS, PORTSMOUTH, O. HIGH GRADE FIRE BRICK BEST BLAST FURNACE & ROLLING MILL BRICK
STEEL WORKS BRICK.
FIREBRICK, KY.

sarily mean that they were placed upon the same basis for comparison. Some kinds of coal are better for steam making than others, and there is also a difference in the amount and quality of the gas to be obtained from coal of different quality and price.—[Cassier's Magazine.

The American Bridge Co. in England.

Some makers of bridges and iron and steel structures have been much exercised of late by foreign competition. The daily press has been called into service, and grievances have been ventilated until the giving out of bridge contracts has become more or less a source of capital for naval politicians. We have had the Atbara incident, the Gokteik incident, and now we hear that American builders have captured the bridge contracts for the Uganda Railway in South Africa, the quantity involved being about 8,000 tons. Now we hear that the American Bridge Co. have opened offices at 110 Cannon St., London, E. C., and appointed Mr. A. A. C. Davies as their London representative. This company, which is a consolidation of the leading bridge companies of the United States, has been incorporated with a capital of £14 000 000 the combined capacity of the company being 600,000 tons per annum. The Pencoyd plant of the A. & P. Roberts Co., one of the constituents, also comprises one of the best and most complete rolling mills for structural steel in existence, having a capacity of 200,000 tons per annum. There is no doubt that the Americans do this class of work extraordinarily cheap, and we can remember contracts for finished work at less than 1d. per pound being signed in America three years ago. "Made in Germany" seems to have no terror for the above named company, as we observe they have taken a contract for the erection of ships for the North German Lloyd Co. at Bremen. It is at least satisfactory to find that they do not intend to confine their operations to the one and only free trade country.—[London Iron and Coal Trades Review.

Change of time C. T. & V.-B. & O. R. R.

Effective Sunday, Nov. 25, following change of schedule will be made: Leave Cleveland for Akron, Canton and Valley Junction 7:15 A. M. instead of 7.25 A. M.; 3 25 P. M. instead of 2:35 P. M. For Pittsburg, Washington, Baltimore, Philadelphia and New York 3:10 P. M instead of 3.25 P. M. For Chicago, 9:35 P. M. instead of 9:40 P. M. All other trains remain the same.

C. T. & V.—B. & O. R. R.

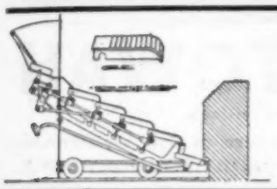
The only line running through sleeping cars to Washington and Baltimore. Through fast train from Cleveland daily at 3.10 P. M. Through local sleeper from Cleveland to Chicago daily at 9 35 P. M. with Royal Blue dining car into Chicago 1: 30 A. M. City Ticket Office, 241 Superior street, Depot foot South Water street.

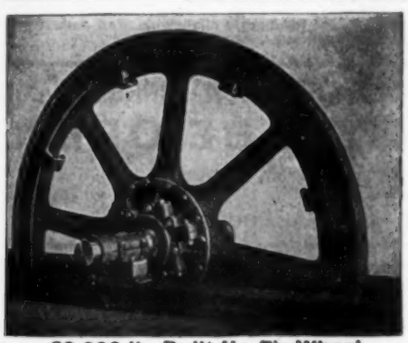
MONONGAHELA IRON & STEEL CO.,
Manufacturers of
Charcoal Bar Iron **CARTER BRANDS** Charcoal Iron Chain
All Sizes
United States Government Specifications Guaranteed. PITTSBURGH, PA.

CRUCIBLE CAST TOOL STEEL.
LA BELLE STEEL CO., PITTSBURG.
"ECLIPSE" COLD DRAWN SHAFTING.
FITZSIMONS & CO., CLEVELAND.
COLD ROLLED STRIP STEEL.
MORRIS & BAILEY STEEL CO., PITTSBURG.
BYRON H. WHITE, WESTERN SELLING AGENT.
68-70 SOUTH CANAL STREET, CHICAGO.

STEAM HAMMERS
DOUBLE STAND.
Made Especially for Hammering TOOL STEEL.
Sizes from 400 to 3,000 pounds.
Fitted with our Improved Piston Valve.
Samuel Trethewey & Co., Ltd.,
PITTSBURG, PA.

CRESCENT STEEL — ESTABLISHED 1860 — INCORPORATED 1886
CRESCENT STEEL CO.
480 PEARL ST. NEW YORK — PITTSBURGH, PA. — 64 & 66 S. CLINTON ST. CHICAGO.


The Century Machine & Mfg. Co.,
MANSFIELD, OHIO.
Inclined and Chain Grate **Mechanical Stokers.**
Lowest in first cost. Cheapest to operate.
Minimum for repairs. Write for prices and particulars.
Mill and Special Machinery.


60,000 lb. Built Up Fly Wheel.
The Dodge Mfg. Co.,
MISHAWAKA, IND.
Engineers. Founders. Machinists.
BRANCHES: Boston, New York, Cincinnati, Chicago, Atlanta, London, Eng.
CONTRACTS FOR HEAVY
Band and Fly Wheels, Rope Sheaves, Rolling Mill Power Equipments.
RESPECTFULLY SOLICITED.
Deliveries prompt. Prices upon application.

Le Chatelier's
PYROMETER
For measuring temperatures between 0 and 2900° F.
Recommended by the Highest Authorities
Successfully used in establishments for the manufacture of

Gas,	Chamotte,
Chemicals,	Cement,
Sugar,	Accumulators,
Terra Cotta,	Incandescent Lamps,
Stone Ware,	Cartridges and Ammunition
Porcelain,	Glass,

Iron and Steel, Malleable Iron.
Also by Boiler Inspectors, Schools and Colleges, for hardening and annealing steel in rolling mills, foundries, etc.
VULCAN MFG. CO., Ltd.,
Pittsburg, Pa.
Station A.

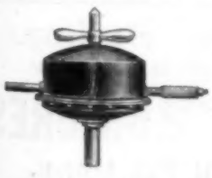
PETER GERLACH & CO.
MAKERS OF
Saws, Tools and Machinery.
Office and Warerooms, 28 Columbus St.
Factories on Columbus, Winter and Leonard Sts.
Cleveland Ohio U. S. A.

ECONOMIC WATER SUPPLY

THE WORLD'S BEST AUTOMATIC PUMP
TRIPLEX POWER PUMPS
FOR GAS ENGINE OR ELECTRIC MOTOR
PUMPS FOR ALL PURPOSES
THE DEMING Co
SALEM - - - OHIO
HENION & HUBBELL
GENERAL WESTERN AGENTS
CHICAGO

"ANALYSES OF PIG IRON."
COLLECTED AND PUBLISHED BY
SEYMOUR R. CHURCH,
307 Sansome St., SAN FRANCISCO.
SEND FOR CIRCULAR.
Price, { $2.50 to U. S. and Canada. / 12s. Foreign Countries. } Postage paid.

Paris Exposition, 1900, confers Highest Award and Two Gold Medals.
ONLY GOLD MEDALS IN THIS CLASS.
CHICAGO PNEUMATIC TOOL CO.,
632-640 Monadnock Bldg., CHICAGO, ILL.


BRANCH OFFICES:
95 LIBERTY STREET, NEW YORK, N. Y. 418 Exchange Bldg., Boston, Mass. 1016 Carnegie Bldg., Pittsburg, Pa. 241 The Arcade, Cleveland, Ohio. 421 Market Street, San Francisco, Cal. Binz Building, Houston, Texas. 605 Fidelity Bldg., Philadelphia, Pa. 316 Lincoln Trust Building, St. Louis, Mo. 416 Hammond Bldg., Detroit, Mich. 508 Equitable Bldg., Denver, Colo.
Pneumatic Riveters, Hoists, Cranes, Jacks, Painting Machines, Motors for every use, Casting Cleaners, etc.

Hammers	Drills
For Chipping Castings.	For Mines.
" Calking.	" Quarries.
" Riveting.	
" Beading.	" Foundries.
" Stone Cutting, etc.	

C. R. BAIRD & COMPANY,

372 BULLITT BUILDING, PHILADELPHIA.

BASIC, BESSEMER, FOUNDRY AND FORGE PIG IRON.

BAR IRON AND WROUGHT PIPE.

BASIC OPEN. HEARTH STEEL.

Oglebay, Norton & Co.,
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PIG IRON AND
COAL - - - -

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McKEEFREY & CO.,

PIG IRON,
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IRON ORES.

515-516 Perry-Payne Building,
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INSPECTED FOUNDRY IRON

that is soft and strong and uniform and shows greatest fluidity—price is yours for the asking—originated and made only by

CLINTON IRON & STEEL CO.

Furnaces and General Offices, PITTSBURG, PA. | New York Offices, 1 CORTLAND STREET.

Alabama Consolidated Coal & Iron Co.,
BIRMINGHAM, ALA.
Manufacturers of the Celebrated Brands of Foundry Iron:

CLIFTON AND ETOWAH

This iron is specially adapted to thin, strong castings.

Also Miners and Shippers of HIGH GRADE STEAM COAL.

And Makers of the Well-known "STANDARD" FOUNDRY COKE.

Selling Agents for the North and West:

MATTHEW ADDY & CO., Cincinnati, Chicago, St. Louis, Pittsburg, Philadelphia, New York.
MOBILE COAL CO., Agents for Coal and Coke in Mobile territory.

LAKE SUPERIOR CONSOLIDATED IRON MINES.

HIGH GRADE MISSABE ORES.

Adams, Ainslie, Duluth, Hibbing, Hartley, Linwood and Pillsbury Mines.

OGLEBAY, NORTON & CO., Sales Agents, Cleveland, Ohio.

CABEEN & CO.,
Real Estate Trust Building, PHILADELPHIA.
Steel Billets and Slabs, both Bessemer and Open Hearth, Pig Iron, Manufactured Steel, &c.

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LAKE SUPERIOR IRON ORES.
206 Perry-Payne Building,
CLEVELAND, O.

PICKANDS, BROWN & CO.,
PIG IRON, IRON ORE and FRICK COKE.
CHICAGO.

Pig Iron.
RED RIVER IRON CO.'S HIGH SILICON PIG.
Hickman Williams & Co.
Exclusive Agents.
The Rookery, CHICAGO. Tel. Harrison 1113.
American Nat'l Bank Bld'g. LOUISVILLE.

J. Wesley Pullman,
238 South Third Street, PHILADELPHIA.
Best American and Foreign **IRON ORES**
Neutral Pig Irons.

FURNACES.

Annealing,
Hardening,
Tempering,
Galvanizing and
Tinning

Furnaces.

Wire Baking
and Japanning

OVENS.

Wire Brazing Outfits.

Write for Catalogue A.

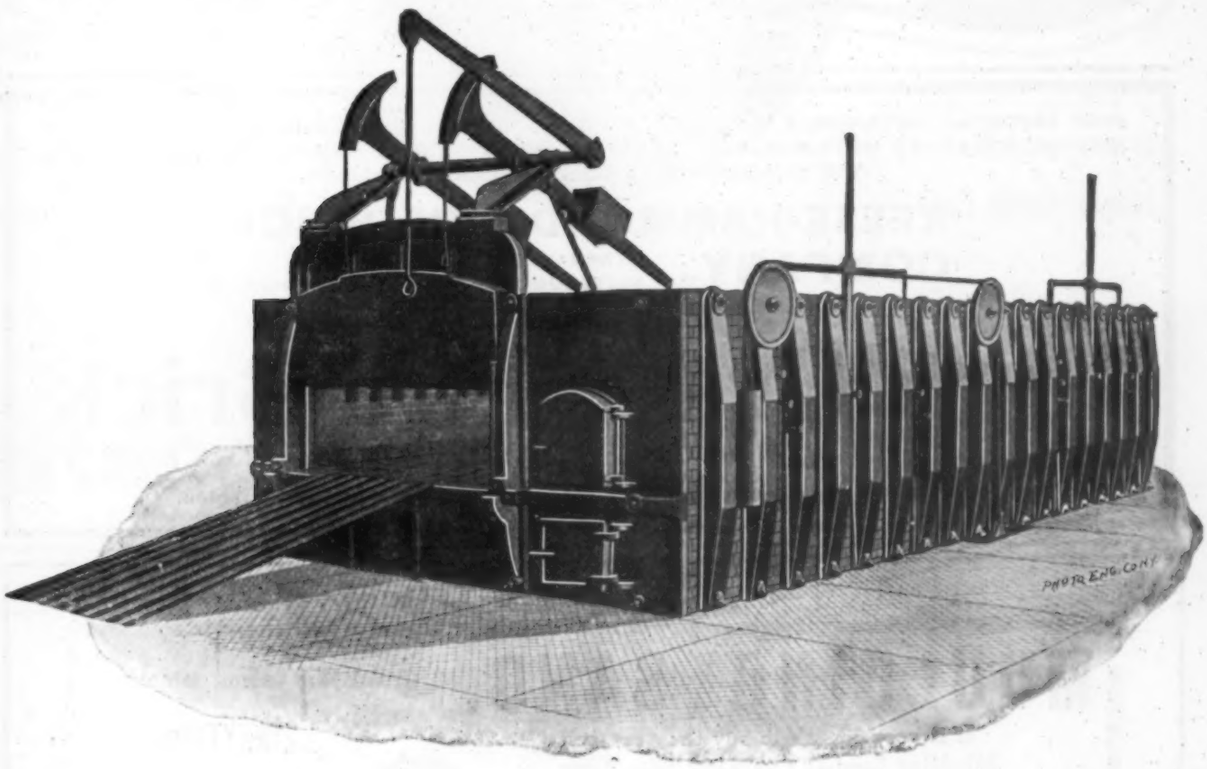
Complete furnace plants installed for heating iron, steel, brass, copper or silver in the most modern and economical manner.

All designs modern, and satisfactory operation guaranteed. . . . .

We also manufacture and install

THE MOST MODERN

FUEL OIL BURNING APPLIANCES.



Rockwell Engineering Co.,

26 Cortlandt St., NEW YORK.

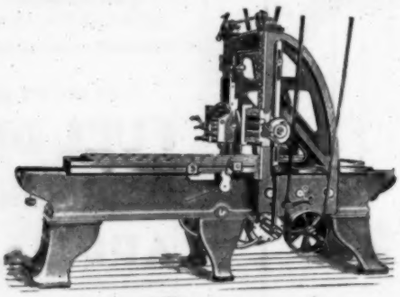
MACHINE TOOLS

TRADE MACHINERY MARK

LARGE STOCK FOR IMMEDIATE DELIVERY.

High Grade Labor Saving Machine Tools.

NEW AND SECOND HAND.



U·BAIRD MACHINERY CO.
123-125 WATER ST.
124-126 FIRST AVE.
PITTSBURGH
PENNA
U·S·A·

TRADE PAPER ADV. AGCY. N.Y.-E

BEST MATERIAL OBTAINABLE.
HIGHEST STANDARD OBTAINABLE.
SEVEN WORKS IN TWO STATES
ON THREE COMPETING TRUNK LINES.
ONE QUARTER OF A MILLION DAILY CAPACITY.

REESE-HAMMOND FIRE BRICK COMPANY,
GENERAL OFFICE: Bolivar, Pa.
PITTSBURG OFFICE: 912-914 Park Bldg.
A Third of a Century of Successful Experience.

High Grade Fire Brick

FOR ALL PURPOSES.

Special Attention given to the Furnace and Foundry and Coke Trade.

MOULDING SAND.

It is very possible to buy the very best Moulding Sand at a very low price, if you knew where to go. The fact I want impressed is that I know just where to go. When you compare other Moulding Sand with mine don't go altogether by the price. Just notice the quality.

Will submit samples.

"EVERYTHING FOR A FOUNDRY."

F. B. STEVENS,
DETROIT.

OUR COMMERCIAL TOURIST

REPRESENTING

The Entire Ohio Valley product of

MOLDING SAND

The largest body of superior Molding Sand under one control, together with 6,300 feet of railway siding, making an unlimited capacity.

Master Van Dye

Superior sand for Stove plate, Hardware, Malleable or Grey Iron, light, medium or heavy Agricultural work, Brass and Core sand, all of which have yet to find their equal.

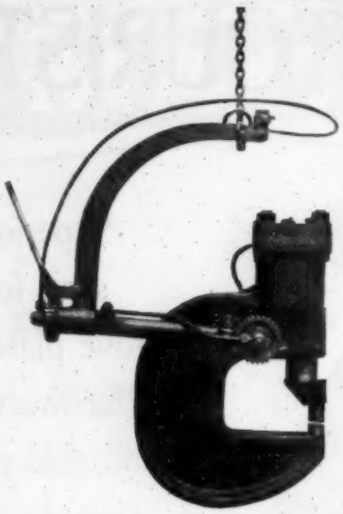
Standard Molding Sand

IN USE FOR FIFTY YEARS.

While our trade has grown to be the best west of the Alleghanies owing entirely to the superior quality of our sand, you can always rely on us, as our quality, quantity and shipping capacity are not equaled . . . . . .

The Newport Sand Bank Co.,

NEWPORT, KY.



R. D. Wood & Co.,

400 Chestnut Street,
PHILADELPHIA, PA.

Hydraulic Riveters, *Fixed and Portable.*

PUNCHES,
SHEARS,
CRANES,
PRESSES AND LIFTS.

HYDRAULIC VALVES.

CAST IRON PIPE.

MATHEWS FIRE HYDRANTS.

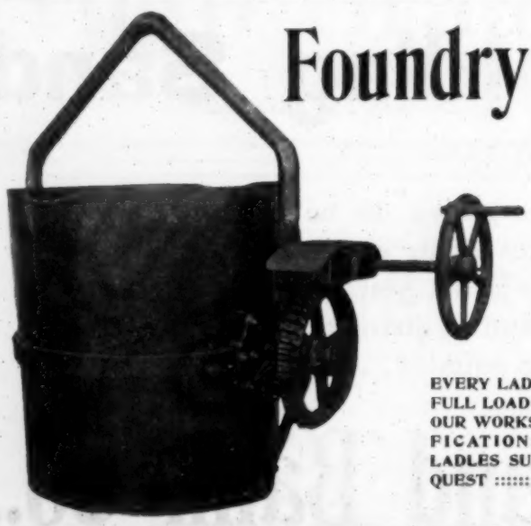
Gate Valves. Valve Indicator Posts. Pumping Engines. Producer Gas Plants.

McDowell, Stocker & Co., Chicago.
Niles Tool Works, London.
White, Child & Beney, Vienna.
V. Lowener, Copenhagen.

J. R. Vandyck, Selling Agt.,
Higley Sawing & Drilling Mach. Co.,
136 Liberty St.,
New York City.

EVERYTHING YOU NEED IN YOUR FOUNDRY

Foundry Ladles



HAND LADLES,
BULL LADLES,
GEARED LADLES,

All sizes from 30 lbs. to 30 tons capacity. Ready in stock for delivery.

EVERY LADLE TESTED WITH FULL LOAD BEFORE LEAVING OUR WORKS :::: FULL SPECIFICATIONS FOR GEARED LADLES SUBMITTED ON REQUEST ::::::::::::::::::::::::::::::::

THE S. OBERMAYER CO., CINCINNATI, O. :: CHICAGO, ILL.

Send for our new general catalogue "C"

FOR SALE BARGAINS

are quickly "snapped up" when placed before the buying public through our

Special Bargain Department.

Short time rates on application to the business department

SMALL INVESTMENTS BRING LARGE RETURNS.

DO YOU WANT ANYTHING?

Our Want Department is at your disposal. Results are bound to satisfy you. Try it.

THE
Iron Trade Review Co.,
Caxton Bldg., CLEVELAND, O.

A STRONG PORTABLE LIGHT
Generated from
KEROSENE OIL,
That will Penetrate
SMOKE AND STEAM

THE BEST LIGHT FOR

FOUNDRIES
BLAST FURNACES
IRON MINES, ETC.

Used also in foundries, where fitted with electric light, for sand cutting at night time.

Send for Prices and Catalog to

Macleod & Clark,

465 East Front St. Cincinnati, O.

Cleveland, Lorain & Wheeling,

Railroad Company.

Time Table effective Nov. 19th, 1900.
Cleveland Depot: Foot of South Water Street.
Elyria Depot: Huron St., West Side.

South Bound.			Central Standard.	North Bound		
15	13	11	Lorain Branch	12	14	16
P.M.	P.M.	A.M.	LV AR.	A.M.	A.M.	P.M.
4:25	1:05	7:05	Lorain	9:10	11:30	6:37
4:40	1:20	7:20	Elyria	8:54	11:16	6:23
4:56	1:38	7:47	Grafton	8:35	10:59	6:05
5:13	1:57	8:00	Lester	8:15	10:41	5:47
5	3	1	Main Line	2	4	6
4:40	1:00	7:10	Cleveland	9:10	11:40	6:40
4:54	1:16	7:24	Brooklyn	8:54	11:24	6:26
5:45	2:02	8:14	Lester	8:10	10:40	5:40
5:56	2:11	8:23	Medina	7:55	10:30	5:26
6:19	2:30	8:43	Seville	7:33	10:10	5:05
6:26	2:36	8:49	Sterling	7:27	10:04	4:59
6:48	2:58	9:11	Warwick	7:05	9:42	4:35
6:56	3:05	9:18	Canal Fulton	6:58	9:35	4:28
7:16	3:23	9:39	Massillon	6:40	9:18	4:11
7:31	3:40	9:58	Justus	6:24	9:03	3:55
8:01	4:11	10:26	Canal Dover	5:55	8:34	3:26
8:08	4:18	10:33	New Philade	5:48	8:27	3:18
8:25	4:35	10:50	Uhrichsville	5:30	8:10	3:00
	4:50	11:15	D. " A.		8:10	3:00
	6:50	1:15	Bridgeport		6:10	1:00
	7:05		Bellaire		5:55	
	P.M.	P.M.	AR. LV.	A.M.	A.M.	P.M.

Sunday Trains between Uhrichsville and Cleveland.
Electric cars Bridgeport to Wheeling, Bellaire and Martins Ferry. Consult agents for best routes and lowest rates to all points.
M. G. CARREL, G. P. A.,
Hickox Bldg., Cleveland.

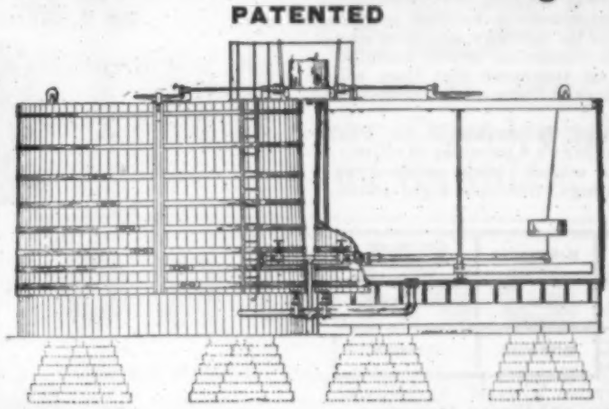
Persistent Advertising.

One who watches carefully the pages of general advertising mediums is struck by two things: the persistency with which those advertisers who are recognized as successful maintain their advertising week after week, month after month, and year after year; they never seem to abate their effort, and apparently the volume of their business increases steadily. The other thing noticeable is the large number of advertisers who thrust their announcements above the surface for a little while and then sink into oblivion. They either had not merit as a basis for their claims or they did not possess the skill to steer their enterprise successfully, or else they lacked the nerve to put forth proper effort.—[Advertising Experience.

Subscribe for
THE IRON TRADE REVIEW.

THE
"Scientific" Water Softening Plant
PATENTED

7,500,000 gallons capacity in daily use.



HONEST GUARANTEE.

furnishes clear, soft feed water for boilers.

THE WEFUCO CO., Cincinnati, O.

Established 1879.
THE OHIO SAND COMPANY.
SHIPPERS OF ALL GRADES OF
MOULDING SAND.
Our Sand is SECOND TO NONE. Banks at Conneaut and Kingsville. Samples and Prices on Application.
Conneaut, Ohio.

Persistence in Advertising

In the expansion of business now bringing profit to so many manufacturers, advertisers who have made themselves regularly prominent in the past five years have been notable in reaping the rewards of persistent publicity.

M. ALLEN, President.

WM. B. FRANKLIN, Vice-President.

F. B. ALLEN, Second Vice-President.

J. B. PIERCE, Secretary and Treas.

BURWELL & BRIGGS, General Agents, 32 and 33 Clark Bldg., 208 Superior St., Cleveland, O.

C. A. BURWELL, Chief Inspector, 32 and 33 Clark Bldg., 208 Superior St., Cleveland O.

J. E. WOLCOTT, Special Agent, 32 and 33 Clark Bldg., 208 Superior St., Cleveland, O.

Locations for Industries.

The name of the Chicago, Milwaukee & St. Paul Railway has long been identified with practical measures for the general upbuilding of its territory and the promotion of its commerce, hence manufacturers have an assurance that they will find themselves at home on the company's lines.

The Chicago, Milwaukee & St. Paul Railway Company's 6,300 miles of railway, exclusive of second track, connecting track or sidings, traverses eight states, namely:

NORTH DAKOTA	MINNESOTA	NORTHERN MICHIGAN
SOUTH DAKOTA	IOWA	WISCONSIN
Express Passenger Trains Fast Freight Trains Throughout.	MISSOURI	ILLINOIS

which comprise a great Agricultural, Manufacturing and Mining territory.

The Chicago, Milwaukee & St. Paul Railway Company gives unremitting attention to the development of local traffic on its lines and, with this in view, seeks to increase the number of manufacturing plants on its system either through their creation by local enterprise or the influx of manufacturers from the East. It has all its territory districted in relation to resources, adaptability and advantages for manufacturing. Specific information furnished manufacturers in regard to suitable locations. Address,

LUIS JACKSON,
Industrial Commissioner, C. M. & St. P. R'y.
Old Colony Building, Chicago, Ill.

Persistence In Advertising

Is one of the requisites of satisfactory results. In the expansion of business which is now noticeable in every section of the country, advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.

FOR GREAT TENSILE STRENGTH, ELASTICITY AND ELONGATION, COUPLED WITH UNUSUAL NON-CORROSIVE QUALITIES.

Castings and Propeller Wheels

Made from

PARSONS MANGANESE BRONZE

Cannot be excelled. Write for Particulars.

SOLE MAKERS

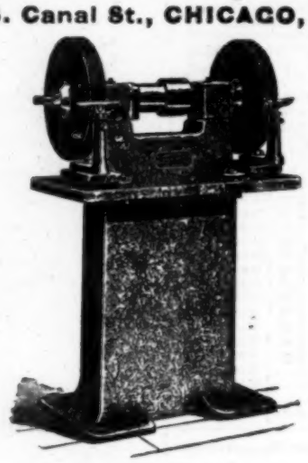
THE WILLIAM CRAMP & SONS'

Ship and Engine Building Company,

PHILADELPHIA, PA.

Northampton Emery Wheel Co.,

20 S. Canal St., CHICAGO, ILL.



NO. 2 1-2 C MACHINE

Arbor through bearings, 1 5-16 inch. Arbor through collars, 1¼ inch. Length of bearings, 6 inches. Distance between wheels, 20 inches. Cone pulley, 3½ inch and 4½ inch x 3 inch. Carries wheels up to 16 inch diameter.

COMPLETE CATALOGUE ON APPLICATION.

Who builds the best Mine Pump?

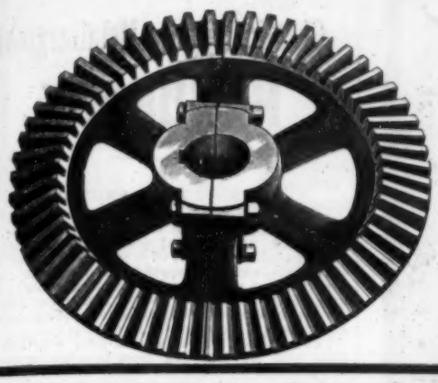
PRESCOTT.

Fred. M. Prescott Steam Pump Co.,

MILWAUKEE, WIS.

The Iron Trade Review is an increasingly valuable medium, through which to sell equipment to machine shop and foundries.

Bevel or Mitre Gears



Are made in different ways; sometimes with the teeth cast necessarily imperfect in fit, wasteful of power and extravagant in ultimate cost. The next, rough cut and hand finished, a great improvement, but not up to the mark yet.

We use special machines and plane the teeth theoretically correct, so that the maximum economical limit is attained.

We would like to figure with you for this class of work and can cut up to eight feet diameter.

R. D. NUTTALL COMPANY,
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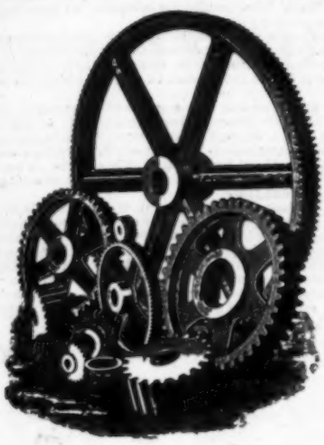

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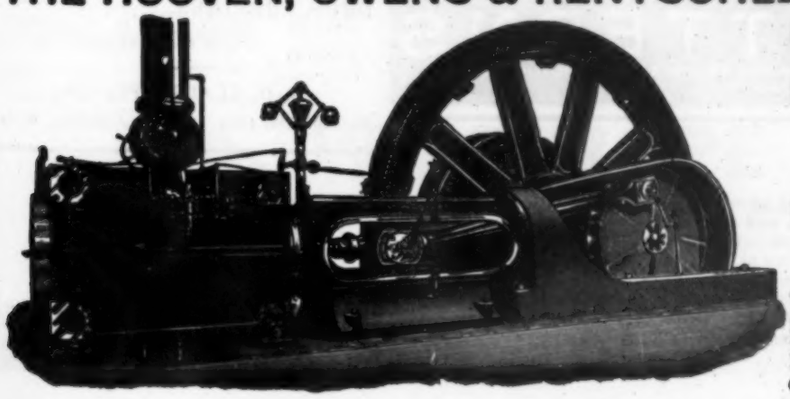

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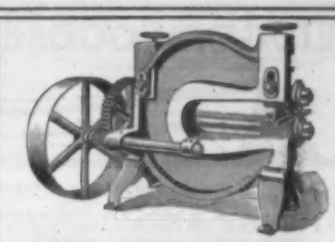

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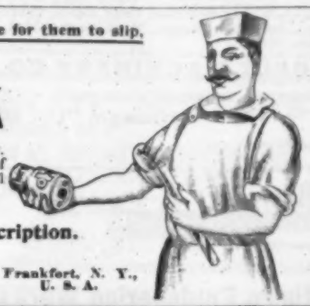

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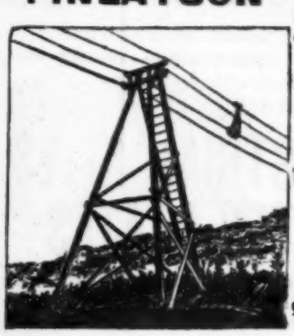

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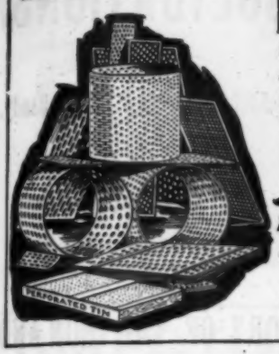

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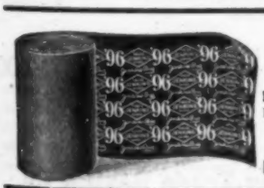

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"The present edition of the Supplement comprises 78 well printed pages and contains an authorized description of the organization of each of the thirty consolidations mentioned, giving its capitalisation, list of officers, general office address and address in most instances of the district offices, and a list of properties owned or operated by it, with the names of previous owners of iron and steel works. The name and the character of every plant are fully stated. For detailed information concerning the plants mentioned and their products reference is given to the page or pages in the Directory in which they are fully described. Iron ore mines, coal mines, coke ovens, railroads, and lake vessels owned by the consolidated companies are also given in sufficient detail."

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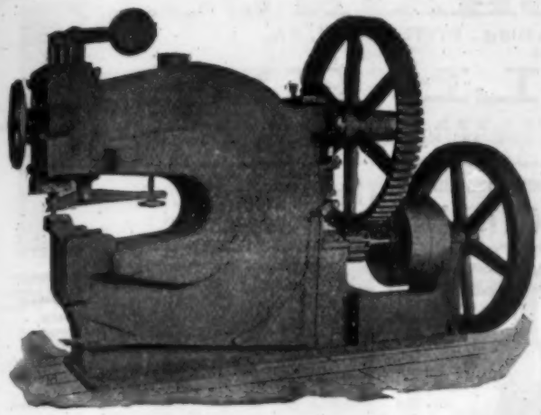

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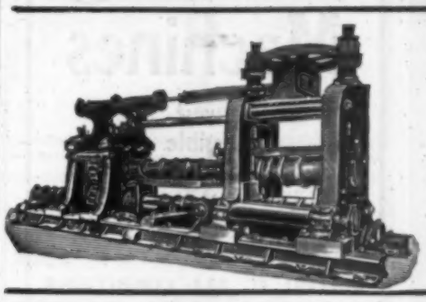

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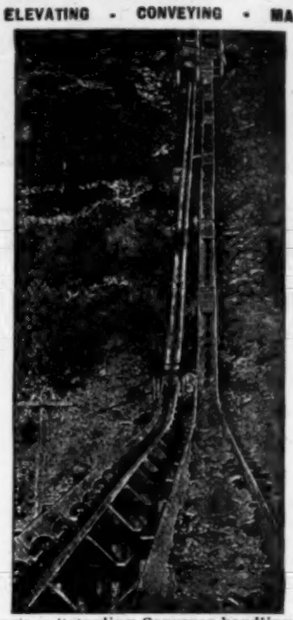

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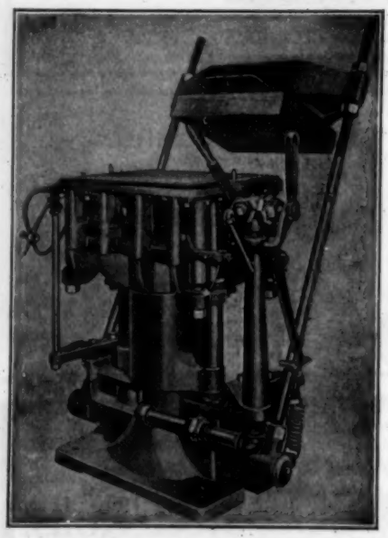

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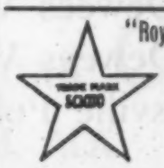

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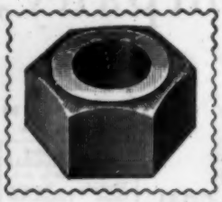

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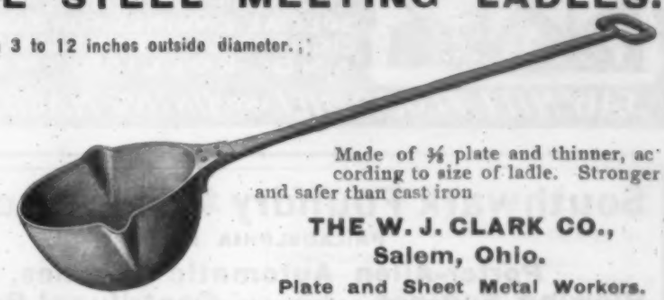

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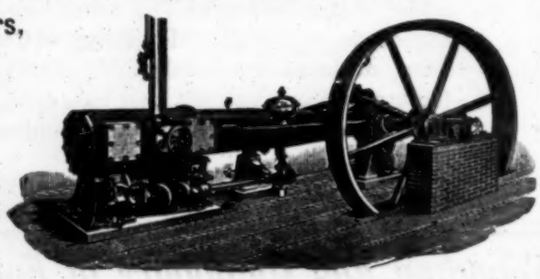

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Northern Engineering Works, Detroit, Mich.
Columbus Machine Co., Columbus, O.
Atlas Machine Co., Pittsburg, Pa.

GAS PRODUCERS—
R. D. Wood & Co., Philadelphia, Pa.

GAUGES (ROLLING MILL)—
Haines Gauge Co., Philadelphia, Pa.

GEARING—
I. & R. Greenwald Co., Cincinnati, O.
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co. Cleveland, O.
F. H. Bultman & Co., Cleveland, O.
Fraser & Chalmers, Chicago, Ill.
Southwark Foundry & Machine Co., Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.
Link Belt Machinery Co., Chicago, Ill.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

GEAR CUTTERS—
F. H. Bultman & Co., Cleveland, O.

GEAR CUTTING—
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co., Cleveland, O.
F. H. Bultman & Co., Cleveland, O.

GEAR LUBRICANTS—
The Ironsides Company, Columbus, O.

GIRDER WORK—
Wm. B. Scaife & Sons, Pittsburg, Pa.

GRINDSTONES—
C. H. Besly & Co., Chicago, Ill.

GRAPHITE PAINT—
Jos Dixon Crucible Co., Jersey City, N. J.

HACK SAWS—
Cleveland Punch & Shear Wks. Co., Cleveland, O

HANGERS—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
I. & R. Greenwald Co., Cincinnati, O.
Link Belt Machinery Co. Chicago, Ill.

HARNESS SNAPS—
Covert Mfg. Co. West Troy, N. Y.

HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia.
Wefugo Co., Cincinnati, O.
The United Boiler Co., Girard, O

HEAVY HARDWARE—
C. H. Besly & Co., Chicago, Ill.

HOISTS—
The Aultman Co., Canton, O.
Lidgerwood Mfg. Co., New York City.

HOISTING ENGINES—
The Edward P. Allis Co., Milwaukee, Wis.
Lidgerwood Mfg. Co., New York City.
Exeter Machine Works, Pittston, Pa.
The Aultman Co., Canton, O.
Webster, Camp & Lane Machine Co., Akron, O.
Vulcan Iron Works, Wilkes-Barre, Pa.

HOISTING MACHINERY—
Exeter Machine Works, Pittston, Pa.
Link-Belt Machinery Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.
The Brown Hoisting Machinery Co., Cleveland, O.
Webster, Camp & Lane Machine Co., Akron, O.
A. Leschen & Sons Rope Co., St. Louis, Mo.

HOISTING ROPE (WIRE)—
American Steel & Wire Co., Chicago, Ill.

HORSE SHOES—
Phoenix Horse Shoe Co., Joliet, Ill
American Steel & Wire Co., Chicago, Ill.

HYDRAULIC TOOLS—
R. D. Wood & Co., Philadelphia, Pa.

INDUSTRIAL CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

INGOT MOLDS—
Lorain Foundry Co., Lorain, O.

INJECTORS—
C. H. Besly & Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.

INSURANCE COMPANIES—
Hartford Steam Boiler I. & I. Co., Hartford, Ct

IRON BUILDINGS—
Illinois Steel Co., Chicago, Ill.
Riter-Conley Co., Pittsburg, Pa.
Wm. B. Scaife & Sons, Pittsburg, Pa.
American Bridge Co., New York City.
Pittsburg Steel Construction Co., Pittsburg, Pa.

IRON, NAILS AND STEEL—
C. H. Besly & Co., Chicago, Ill.

IRON AND STEEL ROOFING—
Berger Mfg. Co., Canton, O.
Wm. B. Scaife & Sons, Pittsburg, Pa.
McCullough Iron Co., Wilmington, Del.

IRON ORE—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
Pickands, Brown & Co., Chicago, Ill.
M. A. Hanna & Co., Cleveland, O.
Drake Bartow & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.
J. Wesley Pullman, Philadelphia, Pa.
Tod, Stambaugh & Co., Cleveland, O.
Jerome Keeley & Co., Philadelphia, Pa.

IRON WORKING MACHINERY—
Atlas Machine Co., Pittsburg, Pa.

IRON WORKING TOOLS—
Avery Stamping Co., Cleveland, O.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Armstrong Bros. Tool Co., Chicago, Ill.
F. H. Bultman & Co., Cleveland, O.
The Armstrong Mfg. Co., Bridgeport, Conn.
Bickford Drill & Tool Co., Cincinnati, O.
Bertsch & Co., Cambridge City, Ind.
Thos. P. Conard, Philadelphia, Pa.
C. C. Wormer Machinery Co., Detroit, Mich.
Carlin Machinery & Supply Co., Allegheny, Pa.
Bethlehem F'dry & Mach. Co., S. Bethlehem, Pa.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co. Pittsburg, Pa.
Springfield Machine Tool Co., Springfield, O.
Pratt Chuck Co., Frankfort, N. Y.

LADLES—
Northern Engineering Works, Detroit, Mich.
The United Boiler Co., Girard, O.
The W. J. Clark Co., Salem, O.
Wm. B. Pollock Co., Youngstown, O.
Whiting Foundry Equipment Co., Harvey, Ill.
S. Obermayer Co., Cincinnati, O., and Chicago.

LAG SCREWS—
Vulcanus Forging Co., Cleveland, O.

LATHES—
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co. Cleveland, O.
Springfield Machine Tool Co., Springfield, O.
Joseph E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.

LATHE TOOLS—
Armstrong Bros. Tool Co., Chicago, Ill.

LINK BELTING—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
The Aultman Co., Canton, O.

LOCOMOTIVES—
Hyde Bros. & Co., Pittsburg, Pa.

LUBRICANTS—
The Ironsides Co., Columbus, O.

LUBRICATING DEVICES—
The Lunkenheimer Co., Cincinnati, O.

MACHINE TOOLS—
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Armstrong Bros. Tool Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
F. H. Bultman & Co., Cleveland, O.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
Carlin Machinery & Supply Co., Allegheny, Pa.
C. C. Wormer Machinery Co., Detroit, Mich.
Bethlehem F'dry & Mach. Co., S. Bethlehem, Pa.
Pelton Engineering Co., Cleveland, O.
Atlas Machine Co., Pittsburg, Pa.
Joseph E. Bissell, Agt. Prentiss Tool & Supply Co., Pittsburg, Pa.
Springfield Machine Tool Co., Springfield, O.

MACHINE SCREWS—
C. H. Besly & Co., Chicago, Ill.

MACHINERY AND TOOL STEEL—
C. H. Besly & Co., Chicago, Ill.
Crescent Steel Co., Pittsburg, Pa.
Byron H. White, Chicago, Ill.
Monongahela Iron & Steel Co., Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill.

MAGNESIA COVERING—
C. H. Besly & Co., Chicago, Ill.

MALLEABLE CASTINGS—
Acme Steel & Malleable Iron Works, Buffalo, N. Y
Link Belt Machinery Co., Chicago, Ill.
Meadville Malleable Iron Co., Meadville, Pa.

MANILLA ROPE—
A. Leschen & Sons Rope Co., St. Louis, Mo.

MANILLA ROPE COATING—
The Ironsides Co., Columbus, O.

MANUFACTURING CHEMISTS—
Wefugo Co., Cincinnati, O.
Grasselli Chemical Co., Cleveland, O.

MECHANICAL STOKERS—
Century Machine & Mfg. Co., Mansfield, O.

METAL BEARINGS—
Theo. Hierts & Son, St. Louis, Mo.
C. H. Besly & Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O
J. J. Ryan & Co., Chicago, Ill.

METAL CEILINGS—
Berger Manufacturing Co., Canton, O.

METAL SAWS—
J. R. Vandyck, New York City, N. Y.

METAL WORK—
Avery Stamping Co., Cleveland, O.

MILL CASTINGS—
Schuykill Iron & Steel Co., Philadelphia, Pa.
A. Garrison Foundry Co., Pittsburg, Pa.

MILLING MACHINES—
U. Baird Machinery Co., Pittsburg, Pa.
Danielson Machine & Tool Co., Cleveland, O.

MINING MACHINERY—
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis,
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Exeter Machine Works, Pittson, Pa.
Wm. Cramp & Sons, Philadelphia, Pa
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Webster, Camp & Lane Machine Co., Akron, O
Fraser & Chalmers, Chicago, Ill.
Wm. B. Pollock Co., Youngstown, O.
Link Belt Machinery Co., Chicago, Ill.
The Automatic Shovel Co., Lorain, O.
A. Leschen & Sons Rope Co., St. Louis, Mo.
Carlin Machinery & Supply Co., Allegheny, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.
Raymond Bros. Impact Pulverizer Co., Chicago.

MINE PUMPS—
F. M. Prescott Steam Pump Co. Milwaukee, Wis.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

MOLDING MACHINES—
Tabor Mfg. Co., Philadelphia, Pa.
Whiting Foundry Equipment Co., Harvey, Ill.
S. Obermayer Co., Cincinnati, O., and Chicago.

MOLDING SAND—
Ohio Sand Co., Conneaut, O.
F. B. Stevens, Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
Webster Foundry Sand Co., Philadelphia, Pa.
Newport Sand Bank Co., Newport, Ky
S. Obermayer Co., Cincinnati, O., and Chicago.

MULTIPLE DRILLS—
Bickford Drill and Tool Co., Cincinnati, O.
Cleveland Punch & Shear Wks. Co., Cleveland, O
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co. Pittsburg, Pa.

NICKEL PLATING OUTFITS—
Northampton Emery Wheel Co., Chicago, Ill

NUTS (Self-Locking)—
National Elastic Nut Co., Milwaukee, Wis.

NUTS AND BOLTS—
Upson Nut Co., Cleveland, O.
National Elastic Nut Co., Milwaukee, Wis.
Milton Manufacturing Co., Milton, Pa.

OILLESS BEARINGS—
C. H. Besly & Co., Chicago, Ill.

OIL BURNERS—
Rockwell Engineering Co., New York City.

OIL CUPS—
C. H. Besly & Co., Chicago, Ill
The Lunkenheimer Co., Cincinnati, O.
The Crane Co., Chicago, Ill.

OIL PUMPS—
C. H. Besly & Co., Chicago, Ill.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
The Lunkenheimer Co., Cincinnati, O.

OIL STORAGE TANKS—
Wm. B. Pollock Co., Youngstown, O.

OIL SEPARATORS—
Harrison Safety Boiler Works, Philadelphia, Pa.

OIL TANKS AND CARS—
Wm. B. Pollock Co., Youngstown, O.

ORE CARS—
The Pressed Steel Car Co, Pittsburg, Pa.

ORE CRUSHERS—
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers Chicago, Ill.

ORE HANDLING MACHINERY—
A. Leschen & Sons Rope Co., St. Louis, Mo.

ORE SCREENS—
Rob't Aitchison Per. Metal Co., Chicago, Ill.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.

ORE TESTING MACHINERY—
Keystone Driller Co., Beaver Falls, Pa.

PACKING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
A. Leschen & Sons Rope Co., St. Louis, Mo.

PAINT—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City, N. J.
The Ironsides Co., Columbus, O.

PATTERN WORKS—
Gobeille Pattern Co., Cleveland O.
Forsythe Pattern Works, Youngstown, O.
C. Birnbaum, Cleveland. O.
Balkwill Pattern Works, Cleveland, O.
Mt. Vernon Pattern & Model Works, Mt. Vernon, O.

PERFORATED METALS—
Aitchison Perforated Metal Co., Chicago, Ill.
Fraser & Chalmers, Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.

PIG IRON—
Cabeen Co., Philadelphia, Pa.
Rogers, Brown & Co., Cincinnati, O.
Reed F. Blair & Co., Pittsburg, Pa.
Clinton Iron & Steel Co., Pittsburg.
Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co. Cleveland, O.
Pickands, Brown & Co., Chicago, Ill
F. B. Stevens, Detroit, Mich.
McKeefrey & Co., Leetonia, O.
Superior Charcoal Iron Co., Grand Rapids, Mich
Spearman Iron Co., Sharpsville, Pa.
Hickman, Williams & Co., Chicago, Ill,
Pickands, Mather & Co., Cleveland, O.
Republic Iron & Steel Co.. Chicago, Ill.
American Steel Hoop Co., Pittsburg, Pa.
J. H. Hillman & Son, Pittsburg, Pa.
C. R. Baird & Co., Philadelphia, Pa.
Pilling & Crane Philadelphia, Pa.
Sloss Sheffield Steel & Iron Co Birmingham, Ala
Cherry Valley Iron Co., Pittsburg, Pa.
Jerome Keeley & Co., Philadelphia, Pa.
American Steel & Wire Co., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala
Alabama Consolidated Coal & Iron Co., Birmingham, Ala.

PIPE (CAST IRON)—
Massillon Iron & Steel Co., Chicago, Ill.

PIPE (RIVETED STEEL)—
Wm. B. Scaife & Sons Pittsburg, Pa.
Wm. B. Pollock Co., Youngstown, O.

PIPE COVERING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

PIPE CUTTING AND THREADING MACHINES—
The Armstrong Mfg. Co., Bridgeport, Conn.

PIPE FITTERS—
Pittsburg Valve, Fdy. & Construc. Co., Pittsburg.

PISTON RODS—
Bethlehem Steel Co., So. Bethlehem, Pa.

PLANERS—
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co. Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O
Atlas Machine Co., Pittsburg, Pa.
Springfield Machine Tool Co., Sprinfield, O.

PLANER TOOLS—
Armstrong Bros. Tool Co., Chicago, Ill.

PLANISHED IRON –
American Sheet Steel Co., New York City.

PLATES—
Enterprise Boiler Co., Youngstown, O.
Republic Iron & Steel Co., Chcago, Ill.
Illinois Steel Co. Chicago, Ill.
American Steel & Wire Co., Chicago, Ill.

PLUMBERS' AND GAS FITTERS' SUPPLIES—
C. H. Besly & Co , Chicago, Ill.
The Crane Co., Chicago, I l.

PNEUMATIC APPLIANCES—
Clayton Air Compressor Works. New York.
W. I. Schaefer & Co., New York City.

PNEUMATIC TOOLS –
Chicago Pneumatic Tool Co., Chicago, Ill.

PORTABLE FORGE—
C. H. Besly & Co., Chicago, Ill.
Vulcan M'f'g Co Pittsburg, Pa.

PORTABLE LIGHTS—
Macleod & Clark, Cincinnati, O.

POWER PRESSES—
Avery Stamping Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
Cleveland Punch & Shear Wks. Co., Cleveland, C.
Danielson Machine & Tool Co., Cleveland. O.
Bethlehem F'dry & Mach. Co. S. Bethlehem, Pa.

POWER TRANSMISSON MACHINERY—
Jeffrey Mfg. Co., Columbus, O.
R. A. Delano, Chicago. Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
I. & R. Greenwald Co., Cincinnati, O.
Link Belt Machinery Co., Chicago, Ill
A. Leschen & Sons Rope Co., St. Louis. Mo
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

PRESSES—
Bertsch & Co., Cambridge City, Ind.
C. H Besly & Co., Chicago, Ill.
Danielson Machine & Tool Co., Cleveland, O.
Avery Stamping Co., Cleveland, O.
Bethlehem F'dry & Mach. Co., S. Bethlehem, Pa.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
Atlas Machine Co., Pittsburg, Pa.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co. Pittsburg, Pa.

PRESSURE GAUGES—
The Bristol Co., Waterbury, Conn.

PULLEYS—
W. A. Jones Foundry Co., Chicago, Ill
R. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
I. & R. Greenwald Co., Cincinnati, O.
Link Belt Machinery Co., Chicago, Ill.
A. Leschen & Sons Rope Co., St. Louis, Mo.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

PUMPS (STEAM)—
The Edward P. Allis Co., Milwaukee, Wis
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred M. Prescott Steam Pump Co., Milwaukee Wis.
Southwark Foundry & Machine Co., Philadelphia Pa.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
The Deming Co., Salem, O.
R. D. Wood & Co., Philadelphia, Pa.

PYROMETERS—
Edward Brown, Philadelphia, Pa.
Vulcan Mfg. Co., Pittsburg, Pa.

RADIAL DRILLS—
Bickford Drill and Tool Co., Cincinnati, O.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co. Pittsburg, Pa.

RAILS—
Hyde Bros. & Co., Pittsburg, Pa.
American Steel Hoop Co., New York City.
Joseph Schonthal, Pittsburg, Pa.

RAILWAY SUPPLIES—
Cleveland City Forge & Iron Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.
Hyde Bros & Co., Pittsburg, Pa.
Joseph Schonthal, Pittsburg, Pa.

RELAYING RAILS—
Hyde Bros. & Co., Pittsburg, Pa.

RIVETS—
Champion Rivet Co., Cleveland, O.
Vulcanus Forging Co., Cleveland, O.

RIVETED STEEL PIPE—
The Wm. B. Pollock Co. Youngstown, O.

RIVETERS—
R. D Wood & Co., Philadelphia, Pa.

RIVETING MACHINES—
Chicago Pneumatic Tool Co., Chicago, Ill.

ROCK CRUSHERS—
Raymond Bros. Impact Pulverizer Co., Chicago.

ROCK DRILLS—
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.

ROLL FORGINGS—
Samuel Trethewey & Co., Pittsburg, Pa.
Frankford Steel & Forging Co., Philadelphia, Pa.

ROLLING MILL MACHINERY—
The United Boiler Co., Girard, O.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
The Lloyd Booth Co., Youngstown, O.
West Penn Foundry & Machine Co., Avonmore, Pa.
Frank-Kneeland Machine Co., Pittsburg, Pa.
A. Garrison Foundry Co., Pittsburg Pa.
Whiting Foundry Equipment Co., Harvey, Ill.
Canton Roll & Machine Co., Canton, O.
Geo. B. Sennett Co., Youngstown, O.

ROOFS—
Riter-Conley Mfg. Co., Pittsburg, Pa.
Wm. B. Scaife & Sons, Pittsburg, Pa.
McCullough Iron Co., Wilmington, Del.
American Bridge Co., New York City.
Pittsburg Steel Construction Co., Pittsburg, Pa.

ROPE AND CORDAGE—
Waterbury Rope Co., New York City.
Link Belt Machinery Co., Chicago, Ill.
A. Leschen & Sons Rope Co., St. Louis, Mo.
Dodge Mfg. Co., Mishawaka, Ind.

SAWING AND DRILLING MACHINERY—
J. R. Vandyck, New York City, N. Y.

SAWS—
Peter Gerlach & Co., Cleveland, O.

SCRAP IRON—
Hyde Bros. & Co., Pittsburg, Pa.
Illinois Steel Co., Chicago, Ill.
Joseph Schonthal, Pittsburg, Pa.
F. Greiner, Philadelphia, Pa.

SCREENS FOR COAL, ORE, ETC.—
Robt Aitchison Perforated Metal Co., Chicago
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
Western Machinery & Supply Co., Chicago, Ill.

SCREWS—
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.
Chicago Screw Co., Chicago. Ill

SECOND-HAND MACHINERY—
Hyde Bros & Co., Pittsburg, Pa.
The Atlas Machine Co., Pittsburg, Pa.
The W. J. Carlin Co., Pittsburg, Pa.
C. C. Wormer Machinery Co., Detroit, Mich.
Carlin Machinery & Supply Co., Allegheny, Pa.
Pelton Engineering Co., Cleveland, O.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co. Pittsburg, Pa.
oseph Schonthal, Pittsburg, Pa.

SEPARATORS—
Harrison Safety Boiler Works, Philadelphia, Pa.

SHAFTING—
R. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Fitzsimmons & Co., Cleveland, O.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
I. & R. Greenwald Co., Cincinnati, O.
Bethlehem Steel Co., South Bethlehem, Pa
American Steel & Wire Co., Chicago, Ill.
Link Belt Machinery Co., Chicago, Ill.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Atlas Machine Co., Pittsburg, Pa.

SHEARING AND PUNCHING MACHINERY—
Bertsch & Co., Cambridge City, Ind.
Danielson Machine & Tool Co., Cleveland, O.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
Bethlehem F'dry & Mach. Co. S. Bethlehem, Pa.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co. Pittsburg, Pa.
R. D. Wood & Co., Philadelphia, Pa.

SHAPERS—
Atlas Machine Co., Pittsburg, Pa.
Springfield Machine Tool Co., Springfield, O.

SHEAR KNIVES—
Samuel Trethewey & Co., Pittsburg, Pa.

SHEET IRON AND STEEL—
Republic Iron & Steel Co., Chicago, Ill.
American Sheet Steel Co., New York City.
McCullough Iron Co., Wilmington Del.
American Steel & Wire Co., Chicago, Ill.

SHEET METAL WORK—
The W. J. Clark Co., Salem, O.

SHIP YARDS—
Wm. Cramp & Sons, Philadelphia, Pa.

SOLID STEEL SHEAR KNIVES—
Samuel Trethewey & Co., Pittsburg, Pa.

SPECIAL MACHINERY—
Cleveland Punch & Shear Wks. Co., Cleveland, O
Avery Stamping Co., Cleveland, O.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Wheeling Mold & Foundry Co., Wheeling, W.
Danielson Machine & Tool Co., Cleveland, C
Enterprise Mfg. Co., Columbiana, O.
Century Machine & Mfg. Co., Mansfield, O.
Jos. E. Bissell, Agt. Prentiss Tool & Supply Co Pittsburg, Pa.

STACKS—
Wm. B. Scaife & Sons, Pittsburg, Pa.

STAND PIPES—
The Wm. B. Pollock Co., Youngstown, O.
The United Boiler Co., Girard. O.

STEAM AND GAS FITTERS' TOOLS—
The Crane Co., Chicago, Ill.

STEAM BOILER INSPECTORS—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

STEAM PIPE AND BOILER COVERING—
C. H. Besly & Co., Chicago Ill.

STEAM PACKING—
C. H. Besly & Co., Chicago, Ill.

STEAM PUMPS—
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred. M. Prescott Steam Pump Co., Milwaukee, Wis.
Edw. P. Allis Co., Milwaukee, Wis.
Southwark Foundry and Machine Co., Philadelphia. Pa.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
The Deming Co., Salem, O
R. D. Wood & Co., Philadelphia, Pa.

STEAM SEPARATORS—
Harrison Safety Boiler Works, Philadelphia,
Wright Manufacturing Co., Cleveland, O.

STEAM SHOVELS AND DREDGES—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.
The Thew Automatic Shovel Co., Lorain, O.

STEAM SPECIALTIES—
C. H. Besly & Co. Chicago, Ill.
The Crane Co., Chicago, Ill.
The Lunkenheimer Co., Cincinnati, O.

STEEL—
Otis Steel Co., Cleveland, O.
Cabeen Co., Philadelphia, Pa.
Crescent Steel Co., Pittsburg, Pa.
Byron H. White, Chicago, Ill.
Monongahela Iron & Steel Co., Pittsburg Pa.
American Steel Hoop Co , Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill.
C. R. Baird & Co., Philadelphia, Pa.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

STEEL BANDS—
American Steel Hoop Co., Pittsburg, Pa.
American Steel & Wire Co Chicago, Ill.

STEEL BLOOMS AND BILLETS—
American Steel & Wire Co. Chicago, Ill.
Cabeen Co., Philadelphia, Pa.
National Steel Co., Chicago. Ill.
Bethlehem Steel Co., South Bethlehem, Pa.
The Lorain Steel Co., Lorain O.
American Steel Hoop Co. Pittsburg, Pa.
C. R. Baird & Co., Philadelphia, Pa.
Jerome Keeley & Co., Philadelphia, Pa.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

STEEL CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

STEEL CASTINGS—
Otis Steel Co., Cleveland, O.
Bethlehem Steel Co., South Bethlehem, Pa.
Acme Steel & Malleable Iron Works, Buffalo, N. Y
The Sargent Co., Chicago, Ill.

STEEL CEILINGS—
Berger Manufacturing Co., Canton, O.

STEEL FRAME MILL BUILDINGS—
Wm. B. Scaife & Sons, Pittsburg, Pa.
American Bridge Co., New York City.
Pittsburg Steel Construction Co., Pittsburg, Pa.

STEEL HOOPS—
American Steel Hoop Co., Pittsburg, Pa.

STEEL PLANTS—
The Wm. B. Pollock Co., Youngstown, O.
The Riter-Conley Co., Pittsburg, Pa.

STEEL SHEETS—
Republic Iron & Steel Co., Chicago, Ill.
American Sheet Steel Co., New York City.
McCullough Iron Co., Wilmington, Del.
American Steel & Wire Co., Chicago, Ill.

STOCKS AND DIES—
The Crane Co., Chicago, Ill.

STOKERS
Century Machine & Mfg. Co., Mansfield, O.

TANKS—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville O
Wm. B. Scaife & Sons, Pittsburg, Pa.
The Wm. B. Pollock Co., Youngstown, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
The Aultman Co., Canton, O.
The United Boiler Co., Girard, O.

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The Wm B Pollock Co., Youngstown, O

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Keystone Driller Co., Beaver Falls, Pa.

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American Tin Plate Company, New York City.

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West Penn Foundry & Machine Co., Avonmore, Pa
Lloyd Booth Co., Youngstown, O.
Canton Roll & Machine Co., Canton, O.

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Crescent Steel Co., Pittsburg, Pa.
Monongahela Iron & Steel Co., Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill.

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Macleod & Clark, Cincinnati, O.

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W. A. Jones Foundry & Machine Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
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Stilwell-Bierce & Smith Vaile Co., Dayton, O.

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Pittsburgh, Bellaire and East	† 3:10 pm	† 6:25 pm
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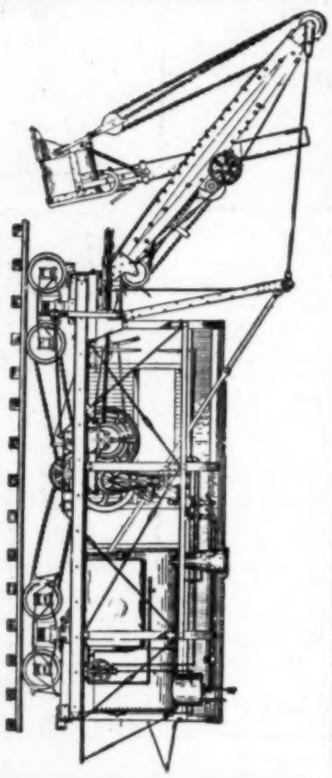

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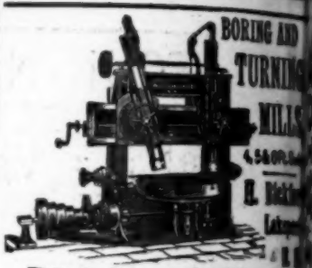

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